

DOCUMENTED BRIEFING

RAND

A Critical Assessment of Total Force Pilot Requirements, Management, and Training

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National Defense Research Institute

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*Prepared for the
Office of the Secretary of Defense*

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PREFACE

This research was initially prompted by projections of pilot shortages in one military service even as that service was coping with existing pilot overages during the drawdown. If there were going to be future shortages, Department of Defense policymakers were interested in whether the problem was more widespread than one service, whether it affected active and reserve components, and what might be done to resolve it. The purpose of this research is to examine the supply and demand for pilots in order to address these questions.

This documented briefing provides the results of research first presented to members of the Office of the Secretary of Defense in November 1992. Updated versions were presented in March, July, and November 1993, as results of the research became available. Moreover, a project memorandum (*Determinants of Pilot Requirements*) was delivered in March 1993 that documented, in detail, research on the requirements for pilots. A separate report, documenting the interactions of military pilot supply and demand with civilian airline hiring in greater detail than in this documented briefing, is in preparation. Additional work within this research project will update requirements and inventory profiles as new data become available; will assess a service's ability to meet reserve component pilot requirements from a quantity and experience perspective; and will evaluate additional candidate policy alternatives for the training and management of pilots. The methodology developed in this documented briefing is broadly applicable to groups other than pilots and should be of interest to military manpower planners across all services.

This research was sponsored by the Undersecretary of Defense for Personnel and Readiness and the Assistant Secretary of Defense for Reserve Affairs and was undertaken within the Defense Manpower Research Center, part of RAND's National Defense Research Institute, a federally funded research and development center sponsored by the Office of the Secretary of Defense, the Joint Staff, and the defense agencies.

SUMMARY

The services are undergoing a fundamental reshaping and restructuring, driven by the demands of a new era of tighter fiscal constraints, new security challenges, new technology, and increased reliance, in some services, on the reserve component. As they are positioning themselves in this new environment and drawing down, the services find themselves constraining accessions, encouraging voluntary departures, and imposing involuntary separations. There is considerable uncertainty as to what these actions bode for the future in terms of supply and demand of personnel and the sustainability of the required force.

Despite the current environment of pilot overages, the Air Force projected, in 1992, a shortage of pilots, beginning in FY 93 and widening to a 3,000 pilot shortfall by FY 97. Faced with this seeming contradiction of a shortage in the midst of a drawdown, the Undersecretary of Defense for Personnel and Readiness and the Assistant Secretary of Defense for Reserve Affairs asked RAND to undertake a comprehensive assessment of these issues.

This documented briefing examines the supply and demand for pilots in the near term and the somewhat longer term (through FY 2002). One of the major contributions of the briefing is the development of conceptual models that allow estimates of inventory and requirements even in changing and uncertain environments. In particular, we address the following questions:

- What are the historical personnel trends for pilots in terms of accessions, retention, and transfer rates between the active and reserve forces?
- What are the current requirements for pilots? How are they changing and why?

- What are the current personnel and training policies used to manage and shape pilot accessions and retention, and how effective will they be in sustaining active and reserve structures in the light of changing requirements and the changing environment?
- What is the effect of civilian airline demand on the military? What is the impact on the sustainability of the military pilot force?

The priorities for analysis were to examine the active Air Force first, Air Reserve Component (ARC) next, then the Navy, with Naval Air Reserve last. Because we find that the Navy will weather the drawdown and restructuring in considerably better shape than the Air Force, we primarily focus on the latter in this summary, although we do examine the Navy and the ARC in the main body of the report.

AIR FORCE

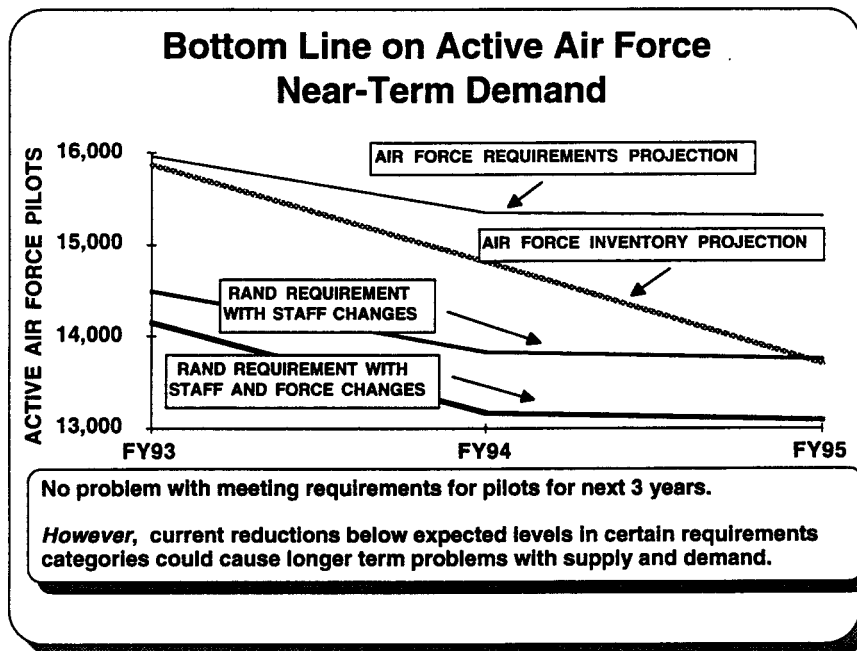
Pilot Requirements

Our tasking on this first phase of research was threefold. First, we were to look at why requirements have changed, specifically at what underlying factors drive those changes. Second, we were asked to look at how pilot requirements have changed since 1988 (the date of the DoD Aviator Retention Study, the last comprehensive work on aviator supply and demand issues). Third, we were to project how pilot requirements were likely to change by FY 95.

Determinants of Pilot Requirements. We developed three classes of determinants—force structure, organizational structure, and other policy change. Force structure changes center on the drawdown to include fewer primary aircraft authorized (PAA). Organizational restructuring covers the full spectrum of internal reorganization that the services are undergoing from squadron and wing through service headquarters. In addition, there are other policy changes that affect pilot requirements, such as changes in crew ratios.

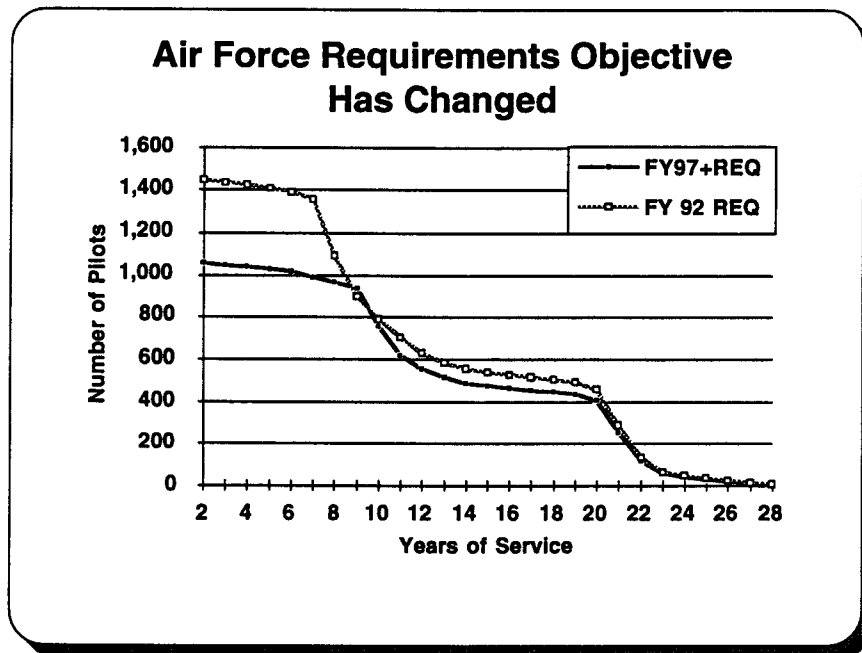
We adapted Air Force terminology and divided pilot requirements into four basic categories—force, staff, training, and manyear or other, which includes transients and students. Force requirements include all of the pilots required to man operational flying units. Training programs are necessary to ensure the operational readiness and necessary skill level of the operational units, including both formal and other training. Staff positions provide for overhead support and supervision required to ensure safe, efficient, and productive flying operations. Finally, there are manyear or other requirements that allow for time in the training pipeline, enable pilots to participate in professional development or formal education programs, or permit pilots to take leave in conjunction with reassignment.

Our research found somewhat different patterns in the force and staff categories of requirements from those indicated by the Air Force. This is primarily because not all planned changes, especially staff changes, have been incorporated into the Air Force's official database. An examination of the underlying determinants that drive changes in pilot requirements provides a window into what these future requirements are likely to be: (1) Force requirements, which are driven by the crew ratio subcategory, are a direct function of force structure (PAA times crew ratio). This category goes down by 34 percent, which is similar to the cut in PAA in the Base Force. However, for FY 95 we estimated a further 10 percent cut in PAA as a result of the Bottom-Up Review and thus in crew ratio force requirements. (At the time our estimates for FY 95 requirements were made, the Bottom-Up Review was not complete). (2) Staff requirements do not appear to fully reflect the ongoing Air Force reorganization. In particular, Air Force reductions in staff requirements do not reflect the projected reductions from the new objective wing nor the reduction in the number of wings. Overall, we would expect staff requirements to go down by an additional 20 percent relative to the Air Force estimate at the time when all organizational changes are reflected in databases.



Overall we estimate FY 95 requirements to be lower than what the Air Force projected for FY 95 by a total of about 14 percent of all pilot requirements. This includes 10 percent in further force reductions and 20 percent in staff requirements, reflecting decisions already made about reorganization. The chart above summarizes our bottom line on FY 95 demand as of our assessment in early 1993. We show (1) the Air Force's projection chart, (2) our estimate of requirements when staff cuts are fully reflected, and (3) our estimate of requirements with both the full staff cut and a 10 percent further cut in forces. As should be clear, we foresee no near-term problem in meeting pilot requirements, although some of the changes in requirements today may exacerbate or cause long-term problems.

To assess longer term problems, we used our determinants model to project requirements to FY 97. We also arrayed these requirements by years of service so that we would have an objective force profile to compare to inventory profiles. The chart below shows how we estimate that the requirements profile will change for the Air Force. The FY 97 requirements projection was made in 1994 after Bottom-Up Review force levels were announced and thus includes the approximate cut of 10 percent in force that we had previously identified.



Pilot Inventory

Determinants of Pilot Inventory. Pilot inventories are influenced by the following factors: (1) production, (2) distribution, (3) absorption capacity, (4) retention, and (5) assignment and promotion policies. These factors dynamically interact to complicate real-world inventory management. For example, the Air Force has moved over time from accessing pilots to sustainment levels, to accessing pilots to absorption capacity, and finally to a vacancy-driven system as the factors have changed.

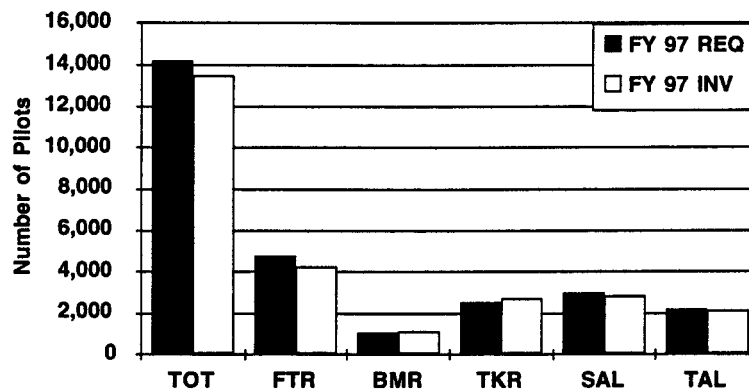
Retention is one of the key factors affecting pilot inventory. One of the central problems for retention of military pilots is civilian airline hiring. Our analysis shows that in the near term, there are plenty of military (and other) pilots to satisfy civilian airline demand¹ through the end of the drawdown in 1997, driven primarily by two factors. On the demand side, the airline industry will continue to hire at levels well below historic averages through the end of this decade. On the supply side, pilots will continue to separate from the military through the drawdown in order to reduce our forces to their post-cold war levels. After the year 2002, as airline demand increases, and the reserve pool for hires becomes much smaller, we believe a situation of excess civilian demand will exist and may well cause problems for military pilot retention.

Several other factors discussed in the briefing will cause changes in future inventory. Based on our estimates of these changes, we projected an FY 97 inventory line. This was then matched to a projected FY 97 requirements line² to see whether problems of mismatch are likely to exist in the near future. Our basic conclusion, shown in the next chart, is that no critical numerical shortages will exist in any major weapons systems (MWSs) through FY 97. (In this chart TOT = total, FTR = fighter, BMR = bomber, TKR = tanker, SAL = strategic airlift, and TAL = tactical airlift.)

¹A more complete analysis of the interaction between civilian airlines and military pilots will be available in a forthcoming RAND publication.

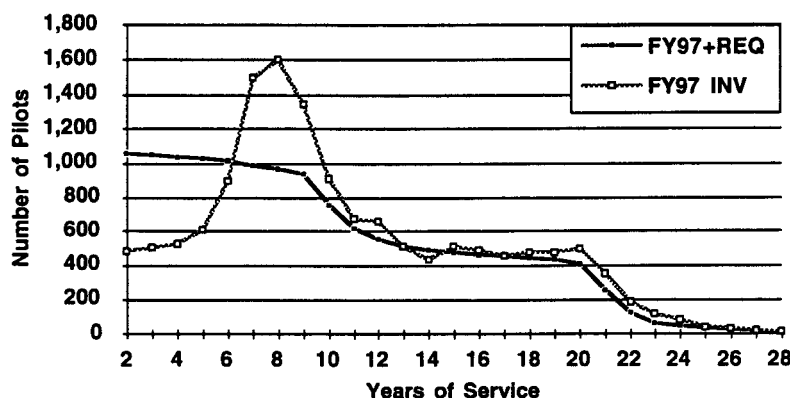
²Since our purpose in this part of the analysis was to discern the effect of our inventory estimate, the FY 97 requirements were made to approximate those used by the Air Force. Thus, we did not incorporate the 20 percent cut in staff requirements that we projected would occur, but had not occurred at the time we did this research in 1994. Recently, the Air Force has moved to make such a reduction in future requirements. We did incorporate a 10 percent cut in force requirements.

No Critical Numerical Shortages Exist in Any Air Force MWS Through FY 1997

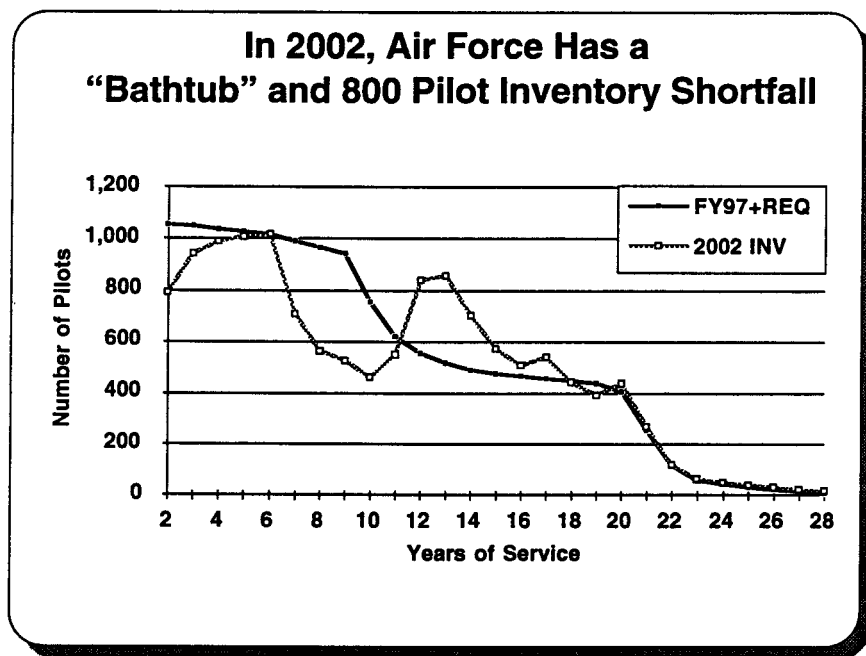


However, there is a serious maldistribution of experience, as revealed in the chart below, that provides a year of service (YoS) comparison of the FY 97 inventory projection with the corresponding requirements objective profile for that year. This maldistribution generates no immediate operational problem, since shortages occur among the least experienced (and presumably least capable) pilots, and the overages occur among those cohorts who typically represent the heart of operational flying experience.

Air Force Experience Maldistribution in FY 1997 Is No Problem



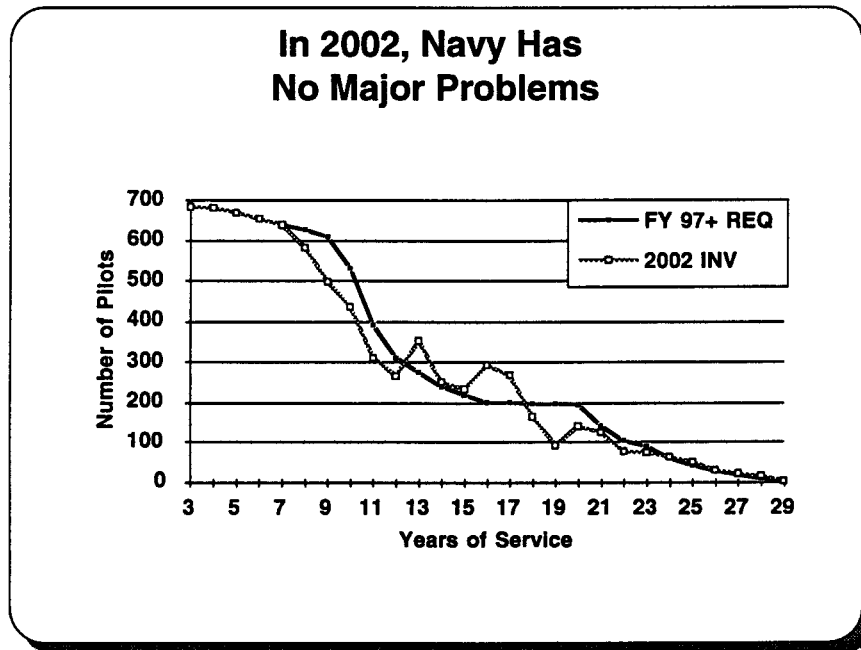
However, an important question is: What is the potential operational impact as those cohorts who are in shortage age to where they would normally assume increased flying responsibilities? To examine this issue, we continued our projection model for another five years (into the “outyears”), and we assumed that outyear requirements were unchanged (so that the same requirements objective profile could be used from FY 97 on).



The Chart above confirms that those cohorts who are in shortage will generate a “bathtub” effect in the inventory by FY 2002, and it also establishes that inventory shortfalls will occur by that time. The shortfall shown represents some 800 Air Force pilots, but it could increase to nearly 1,200 pilots if there are additional losses in FY 93. Individual MWSs reflect similar patterns to those exhibited by the total inventory, though these patterns are less pronounced in every MWS except fighters.

NAVY

Specific details about the Navy inventory and requirements lines are provided in the main body of the report. Our basic conclusion is summarized in the chart below, which shows that the Navy, unlike the Air Force, will not face any major problems in this area in the future. (Although not shown here, this conclusion holds for the near term as well, where the projected FY 97 requirement line, matched against the FY 97 inventory line, shows no major experience maldistribution either.)



Alignment of inventory and requirement distributions for the Navy in FY 2002 is remarkably close. Indeed, an overall 300 pilot shortage is a significant improvement over the pre-drawdown situation in FY 92 in which a numerical shortage of 2,000 pilots existed. (Some drawdown losses probably occurred in FY 92 inventory that were not reflected in requirements.) There are several options available to obtain the slight retention improvements required to match the requirement numbers, and there is also a possibility for requirements to continue to drop in the outyears if aggressive policy action in that area is initiated by the Navy.

PILOT MANAGEMENT AND TRAINING

Most of the discussion here focuses on the the Air Force, because, as we showed above, it is this service that will face outyear inventory problems. Several alternative policies available to deal with the imbalance are shown in this chart.

Alternative Policies to Counter Outyear Requirements/Inventory Mismatches	
Policies	Policies Affect...
1. Access to requirements	1. Inventory
2. Optimize UPT production	2. Inventory
3. Reexamine UPT Instructor Pilot policies	3. Inventory and Requirements
4. Redistribute unspecified requirements	4. Requirements
5. Increase retention	5. Inventory

Some of these policies, however, will tend to create additional problems or exacerbate the severity of the bathtub problem discussed above. For example, accessing to requirements creates absorption problems because of the erratic annual changes in new production required by such a policy. Optimizing Undergraduate Pilot Training (UPT) production both over fiscal years and across MWSs, while it reduces the absorption problems, cannot completely correct annual inventory shortfalls. Retaining First Assignment Instructor Pilots (FAIPs) would increase overall absorption capacity, which might help counter the bathtub effect, and would provide much needed flexibility (as it has in the past) in dealing with imbalances, although we recognize this policy has some disadvantages. Redistributing non-MWS-specific requirements among the MWSs would shift, but not reduce, requirements but might help adjust imbalances among MWSs.

The most obvious course is to increase retention now and in the future. Unfortunately, our analysis shows, somewhat surprisingly, that this policy does not help. If we compare the FY 2002 pilot inventory projection obtained by using basic retention rates with the corresponding inventory projection obtained using increased retention rates, we see that the “bathtub” appears worse rather than better. The reason for this is that increased retention now keeps pilots who are already in overstrength year-of-service cohorts, which exacerbates the future experience maldistribution and limits current absorption capability and UPT production. Moreover, if one waits to the year 2002 to increase retention, it will not solve the numerical problem because of the numerically small cohorts at that time that result from reduced training in the middle 1990s. Either way, relying on retention to solve the FY 2002 problem appears not to be the best course of action.

Additionally, increased retention creates future problems in terms of the sustainability of the Air Reserve Component. Of the active losses that occurred during the five year period from FY 88 to FY 92, the ARC has averaged hiring about 420 pilots per year. These hires represent less than one-third of the available active loss pool during the period. If the ARC requirement for new hires from among active losses remains at these levels, they will need to hire much higher proportions of the active loss pool. High-retention patterns produce an even smaller active loss pool (and steady-state annual losses of only 330 pilots), which could easily be inadequate to sustain ARC requirements even if they were to decrease substantially. Loss projections by MWS indicate that the problem could be amplified when individual MWS categories are examined, depending upon the nature of ARC requirements.

There are several current force-shaping initiatives undertaken by the Air Force that may help correct the severity of the future “bathtub” effect. These include the pilot early-release program, the bonus-eligible nontaker initiative, the minimum field-grade manning initiative, and the third-pilot program for KC-135 crews.

RECOMMENDATIONS AND FUTURE ISSUES

The chart below summarizes our main recommendations and what we see as future policy issues facing the Air Force.

Recommendations

Redistribute non-specific MWS requirements

Examine assignment alternatives that increase the availability of absorbing cockpits

Smooth UPT production

- Defer further action to increase UPT production until problem scope and severity are better defined
- Limited FAIP use provides a temporary hedge if required

Study the need for permanent problem resolution and evaluate the merit of these alternatives

- UPT instructor manning alternatives
- ARC/Active flow options

Study the adequacy of active losses to support ARC

If the problems were mainly with one MWS such as fighters, the first recommendation would shift shortfalls from that MWS to others. The second recommendation is self explanatory. Both, together with the Air Force initiatives already under way, can go a long way toward controlling the severity of the future pilot inventory problems.

The third recommendation suggests minimizing effects on the training base by balancing UPT needs over a longer period than one year. We feel that no drastic action to increase UPT production is warranted at this time. More extreme policy options can wait until the scope and severity of the problem can be better defined, and the number of FAIPs can be used to provide a hedge during this process.

If the problem is sufficiently severe, its permanent resolution could rely on alternative manning options for UPT instructors. This could include contracted civilian instructors, reserve component instructors, or continued use of FAIPs. No shortage would exist absent the decision to make UPT instructors MWS specific. While there are stated benefits to this, there are costs as well, which should be studied. Cooperative use of active and ARC assets could be mutually beneficial.

An important issue that requires additional study is whether projected active losses will be adequate to support ARC requirements. Unless it is examined carefully, this could present a major problem in the outyears. A growing share of aircraft and missions is being housed in the ARC as the Air Force draws down. This underscores the importance of keeping a total force perspective when considering any of these policy options.

A CRITICAL ASSESSMENT OF TOTAL FORCE PILOT REQUIREMENTS, MANAGEMENT, AND TRAINING

The services are undergoing a fundamental reshaping and restructuring, driven by the demands of a new era of tighter fiscal constraints, new security challenges, new technology, and increased reliance, in some services, on the reserve components. For example, in the last seven years, Air Force active end strength has decreased by over 180,000, and more reductions are proposed. By the end of FY 95, Air Force active end strength will total about 400,000, while reserve strength will remain approximately the same at about 194,000.

To reduce strength, the services are constraining accessions, encouraging voluntary departures, and imposing involuntary separations. Service personnel policies that affect pilots are changing as well to cope with downsizing and restructuring.

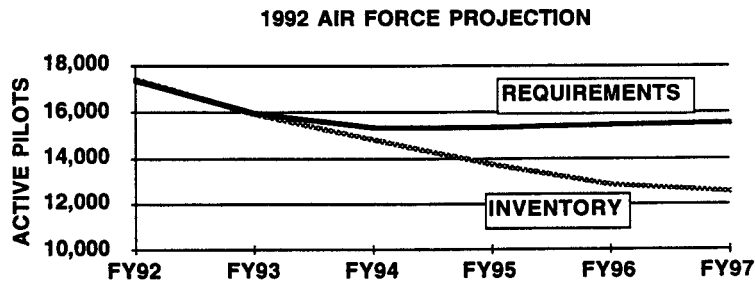
Needed, in light of the changing environment, is an assessment of three areas: (1) the requirements for pilots in the context of the defense drawdown and restructuring; (2) the supply of pilots in the same context and the sustainability of such a force—given historical trends in accession, retention, and transfers to the reserves; and (3) the effective-

ness of current personnel management and training policies in terms of their effectiveness in meeting future needs.

This project provides such an assessment. In particular, we answer the following questions:

- What are the historical personnel trends for pilots in terms of accessions, retention, and transfer rates between the active and reserve forces?
- What are the current requirements for pilots, how are these requirements changing, and why are they changing?
- What will be the interaction of a smaller Air Force and Navy with the national economy? Specifically, what will be the civilian demand for military pilots, what will be the military supply (how many pilots can the military expect to migrate to civilian airlines), and are policies needed to manage or control this flow of pilots? These questions overlap with issues of active-reserve flows since many civilian airline pilots also fly in the reserve component.
- What are the current personnel and training policies used to manage and shape pilot accessions and retention and how effective will they be in sustaining active and reserve structures in the light of changing requirements and the changing environment?

Rationale for Study



Research objectives

- Examine demand for pilots in the Air Force and Navy in context of defense drawdown and restructuring
- Assess current management and personnel policies in terms of their effectiveness in meeting future demand

The services have historically projected a problem in balancing supply and demand, with shortages in certain areas. Despite the current environment of pilot *overages*, caused by the post-cold war drawdown, the Air Force projected in 1992 a future *shortage* of pilots. The figure above shows an overall shortage of pilots beginning in FY 93, with the gap widening to a 3,000 pilot shortfall by FY 97.

This seeming contradiction prompted then-Secretary of Defense Cheney to question these projections of future shortages. The primary questions raised by Secretary Cheney were (1) what will pilot requirements and inventories look like in the future and (2) what personnel and management policies exist to address these issues? In response to these questions, RAND was asked by the Undersecretary of Defense for Personnel and the Assistant Secretary of Defense for Reserve Affairs to examine these issues.

The last comprehensive review of aviator supply and demand issues had been the DoD Aviator Retention Study of 1988. Significant changes since that time warrant a fresh look at pilot requirements, management, and training.

Outline of Briefing

Background

- **Historical context**
- **Current environment**
 - **Uncertainties**
 - **Total Force**

Pilot requirements

Pilot inventory

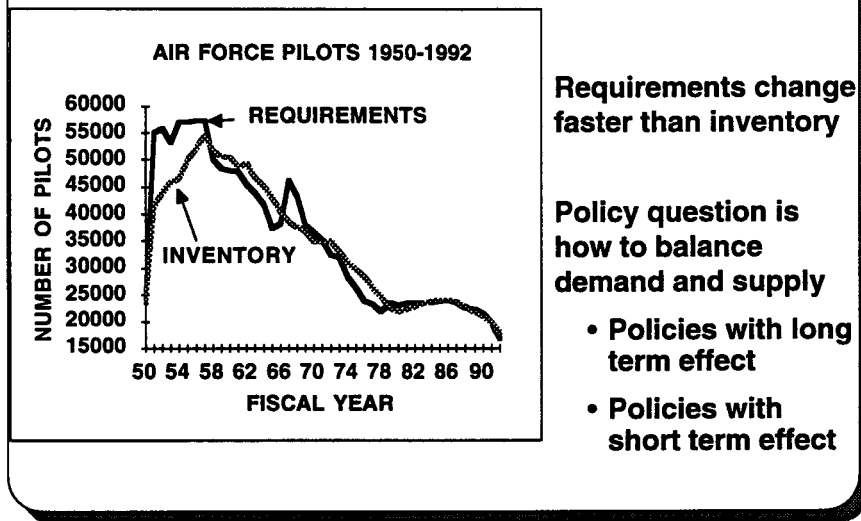
Pilot management and training

Future policy issues

This briefing covers five topics. First, we provide the historical background of pilot supply and demand and a brief description of the current context for this work. Second, we present the results of our research on the demand for military pilots. Third, we discuss our research on pilot inventory, with special emphasis on the factors affecting pilot inventory. One important factor is the interaction with civilian airlines and the likely effect of airline demand for military pilots on retention. Fourth, we present our analysis of pilot management and training and our projections of future pilot inventory. Last, we offer our assessment of future policy issues.

We begin by examining the historical context of pilot management.

Historical Pilot Management



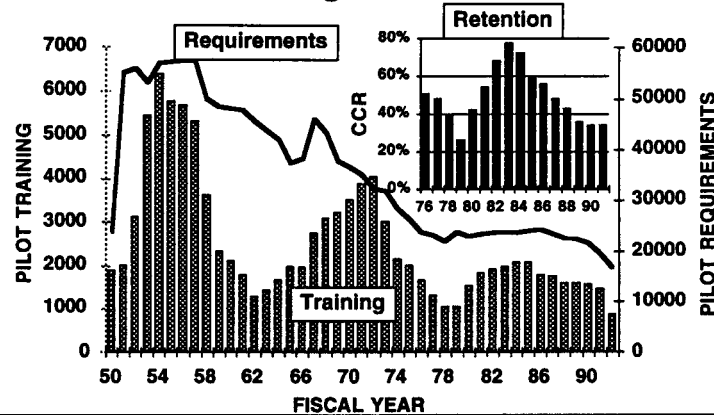
The drawdown is a period of significant change, but, as the chart makes clear, there has been constant change over the past 40 years, both up and down.

In general, the pattern that emerges is that requirements appear to change more quickly at the beginning of a period of growth or decline (although we have found that even this is not instantaneous), but inventory appears to lag behind. The services cannot develop or separate military pilots as quickly as their needed numbers can be changed on paper.

During military buildups, the inventory of pilots typically falls short of requirements. This was the case during the Korean War of the 1950s, the Vietnam Conflict in the 1960s, and the Reagan buildup of the 1980s. As forces are reduced during postconflict eras, inventory tends to exceed requirements.

Recognizing that supply will always lag the requirement, the policy question is how to bring supply and demand closer to equilibrium. There are two main equilibrating mechanisms—training of new pilots and retention, each of which has somewhat different effects. These are further discussed in the next chart.

Traditional Long Term Policy “Balancers” Are Training and Retention



**Training and retention are imprecise, are intertwined,
and their long term effects lag the requirements cycle**

There have been two traditional long term policy “balancers.” First, increases or decreases in accessions (training of new pilots) can be used to bring supply (inventories) into equilibrium with demand (requirements). In this chart we contrast the Air Force’s pilot requirements line with Air Force Undergraduate Pilot Training (UPT) accessions over a 40 year period. Note that changes in demand (requirements) are not immediately met by changes in training. In particular, reductions in demand are difficult to match because of the training pipeline. Commitments to UPT are typically made by undergraduate students several years before they even begin training. As can be seen, there was a dramatic reduction in the requirements for pilots in 1967, as the Vietnam War began to draw down. However, reductions in UPT accessions did not begin until 1972.

A second long term policy “balancer” has been retention. The measure of effectiveness used for retention in this chart is the Air Force’s Cumulative Continuation Rate (CCR),¹ a measure of retention in the 6 to 11 year group (the critical time after the Active Duty Service Obligation ends and before officers make career decisions to stay

¹It is important to point out that this measure is no longer considered to be a good retention measure; currently the take rate for the Aviation Continuation pay (ACP) bonus is being used as a short term measure and Total Active Rated Service (TARS) as a long term or steady-state measure to estimate future retention of pilots. However, because it was used over much of this time period, we show the CCR in the chart.

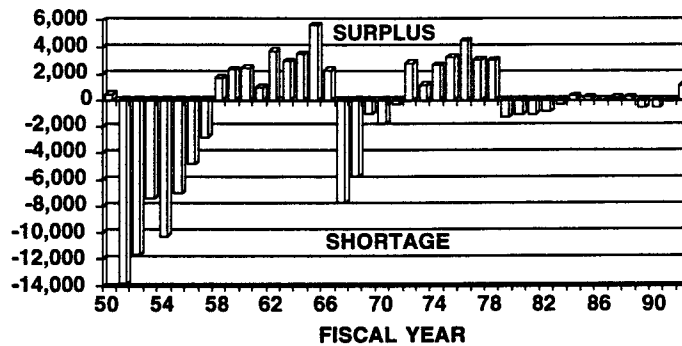
through to retirement). This measure has only existed since 1976, the time when the Air Force began its Rated Management process.

By superimposing the retention graph on the training graph, we can see the interaction between these two policy mechanisms. Retention and training should not be viewed in isolation from one another. The low retention rates of the late 1970s, for instance, are applied against relatively high UPT accessions from the early 1970s. Conversely, the high retention rates of the mid-1980s are applied against the low UPT accessions in the late 1970s. Therefore, it is the combined effect of these two “balancers” that tends to bring supply and demand into equilibrium, and it is important to track both and understand their interaction.

The lags associated with these measures that have long term effects drive the need for other policy mechanisms to be used in the short run. We turn to these next.

Assignment System Is Used to Adjust Disequilibrium in the Short Term

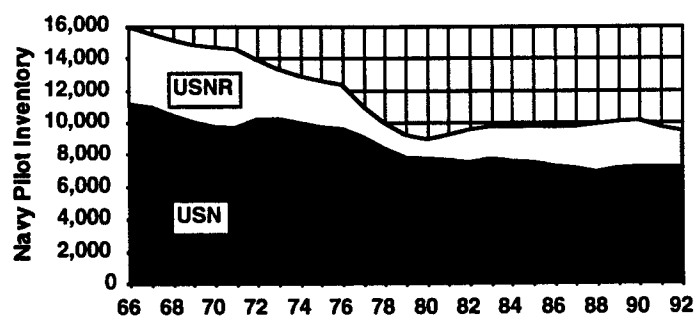
PILOT INVENTORY ABOVE OR BELOW REQUIREMENTS



Rated supplement and priority assignment system are examples of policy solutions with short term effect

Within the Air Force, the assignment system has traditionally been used to mitigate shortages and surpluses in the short run. The priority assignment system, where certain requirements are filled on a priority basis with some other requirements left unfilled, has been used to cope with historical shortages of pilots. During the surplus period in the 1980s, additional requirements (the rated supplement) were created that allowed the assignment of rated officers not needed for pilot assignments to nonrated career fields for career development. This also provided a surge capability to meet contingency requirements in the past, but this role is now filled by reserve components.

Navy Uses Active-Duty Reserve to Balance



Overall trend is downward but Navy has not yet cut as much as AF.

Navy assigns active-duty reserves for inventory management, increasing during build-ups and decreasing during build-downs

The Navy uses the active-duty reserve to help balance supply and demand. Increasing pilot requirements are met by increasing the number of newly commissioned U.S. Naval Reserve (USNR) officers to enter flight training. This can be seen from the chart, which shows the marked decline in the number and proportion of active-duty reserve pilots from the late 1960s/early 1970s to the early 1980s. In 1971–1972, approximately 35 percent of pilots were active-duty reserves. However, as requirements declined, these pilots were released from active duty or not brought on active duty, as was the case between 1972 and 1980. By 1980, only 13 percent of pilots were active-duty reserves. This proportion rose from 1980 to 1988, when about 30 percent of pilots were active-duty reserves. Currently, 23 percent of pilots are active-duty reserves, and this number is expected to continue to decrease as the overall number of pilots decreases. The Navy is separating USNR pilots, who would be willing to stay, from active duty to accommodate the ongoing drawdown.²

Against this historical background, we now look at the current environment in which the services must attempt to balance supply and demand.

²Although the Air Force has also used its Officer Training School in the past to provide a pilot training surge capability when necessary, the numbers are smaller (essentially zero for several years now), and its management of these officers differs markedly. Reserve officers on active duty in the Air Force are automatically screened for augmentation by servicewide centralized boards, while USNR officers retain a separation date and must formally apply for augmentation. The naval aviators who apply are screened separately by aircraft type for selection. Recent selection rates have been below 15 percent of those applying (for most types of aircraft).

Current Environment Creates Uncertainty

Numerical drawdown

- **From Base Force to Bottom-Up Review**
- **Reductions in Undergraduate Pilot Training**

Organizational restructuring

- **Service reorganizations**
- **Air Force composite wings**

Integration and active/reserve mix

- **Navy-Marine Air integration**
- **Air Force-Air Reserve Component mix**

We are currently in the midst of an extremely difficult period of dramatic change, largely driven by the post-cold war drawdown. First, forces are being reduced significantly. The first iteration of reductions were to a Base Force level by 1995; the next iteration is to a Bottom-Up Review level by 1999. Second, the Air Force (and to a lesser extent the Navy), is undergoing a major reorganization. Third, there are force structure shifts, both between components and between services, that will have important impacts on demand.

With respect to aviation, the effects on the Air Force thus far have been the greatest. By 1992, it had undergone the bulk of its cuts in building down to Base Force levels, having already absorbed approximately two-thirds of these cuts. It has also undergone a major reorganization, which is complete on paper and which it began implementing in 1992.

In general, the Navy drawdown began later than the Air Force drawdown. But, as with the other services, the post-cold war era will have a significant impact on the Navy. The new strategic direction has been described as a fundamental shift away from warfighting on the sea to joint operations from the sea. Certain naval warfare areas will be deemphasized. The new strategy will affect naval aviation in three basic areas—force structure, organizational structure, and policy about integration of Naval and Marine Air.

Under the Base Force plan, cuts, including cuts of carriers, were to be achieved by 1995. The Bottom-Up Review made additional cuts that extend out to 1999. Among them are a reduction to 10 active and 1 reserve carrier air wings (CVWs). In January 1993, primary aircraft authorized (PAA) for active Navy attack and fighter aircraft were projected at 616 for FY 95 (down from 678 in FY 92). One year later, the projection called for 528 in FY 95 with further cuts beyond that. Organizationally, the squadrons and air wings will be different from their predecessors in that the mix of aircraft will be different (e.g., the A-6 will leave the inventory), the number of aircraft will be different (i.e., 50 plane wings instead of wings of 80 planes or more), and Marine Air will be more closely integrated (e.g., active and reserve Marine squadrons operating as part of CVWs).

Finally, the Air Force is facing a third area of change regarding the shift in the active-reserve force mix. The active Air Force is being reduced significantly; the Air Reserve Component (ARC) less so. This will result in a growing share and changing mix of aircraft and missions being housed in the ARC. The Secretary and Chief of Staff of the Air Force have stated that Air National Guard (ANG) and Air Force Reserve (AFR) personnel strengths will be maintained at approximately current levels even as the active component shrinks. At Base Force levels, ARC units will increase as a percentage of the total force by 1995. Active/reserve mix for two major weapons systems, tankers and airlift, is moving toward 50 percent by FY 95.

Additionally, policy changes in the active component have a future effect on the ARC. For example, the decrease in active flying units and the excess supply of separating active pilots in the near term allows good recruiting of prior-service pilots by the ARC now, but the opposite will occur in the future. Extending the active-duty service commitments after completion of undergraduate pilot training will change the future dynamics of reserve pilot flow. Retention bonuses for pilots who agree to serve through their 14th year of service also affect the number and timing of active separations. Increases in active-service duty will age the future pool of prior-service pilots available to the ARC, something that the ARC may not view as a desirable shift. This issue is further addressed in the next two charts.

It is clear that new ways of thinking and new policies will be needed to deal with this changed and still changing environment.

Total Force Context Emphasizes Flows From Active to Reserve

**Sustaining Air Reserve Component (ARC) with
experienced pilots may be more difficult in the future**

- **Fewer active pilots**
- **Reduced training**
- **Fewer active cockpits for giving experience**

Inexperienced pilots not helpful to ARC

- **Limited numbers can be used**

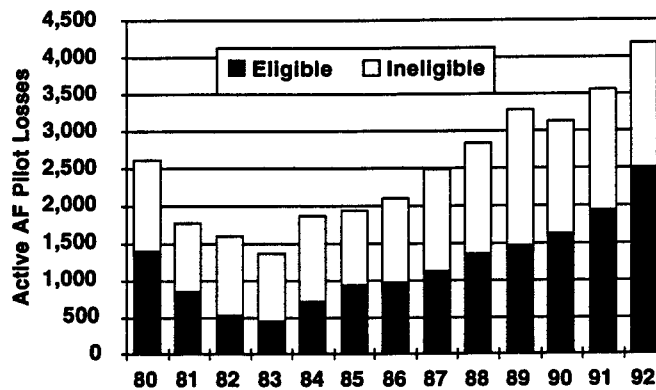
Historical flows may not be sustainable in the future

Navy has no difficulty sustaining Naval Air Reserve

In a total force context, it is important to examine the question of flows across components. Military strategy places considerable emphasis on the reserve components, and it is, therefore, important to analyze the effects of military downsizing on the sustainability of the reserve components. The number of prior-service pilots available to flow into the reserve components depends primarily on active accessions, the active inventory of pilots, and active-duty loss patterns. As the active force structure is reduced, the inventory of active pilots goes down from both the actual reduction in cockpits and from the ability of the remaining operational units to “absorb”—to give experience—to recent graduates of pilot training. If ARC demand for pilots stays relatively constant, then at some point active-duty prior-service supply is insufficient to satisfy the demand.

Increasing the flow of UPT graduates directly to the ARC beyond some limited number may not be a reasonable solution in that it increases the training burden in the ARC, requires greater levels of training resources to teach skills, and reduces the overall levels of experience in the ARC, which is one of its core competencies. Historically, about 60 percent of eligible active pilots have expressed an interest in joining an ARC unit at time of separation from the active force. Some 40 percent of eligibles actually do so. However, as the active inventory grows smaller (as active size is reduced relative to the ARC), the ability to give experience in the active force to new pilots and the ability to satisfy the ARC demand for reserve pilots with experienced prior-service pilots will be considerably diminished.

Active Air Force Pilot Losses (by Eligibility to Enter ARC)

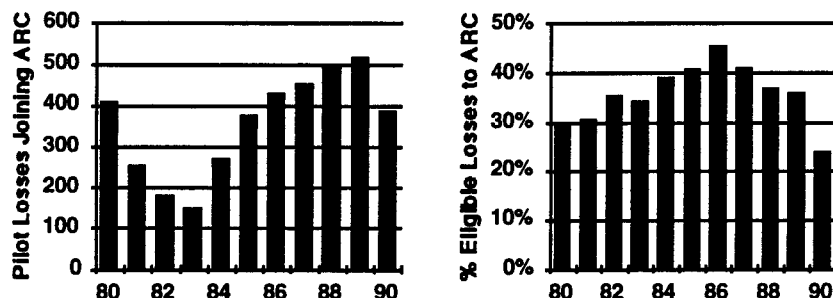


We approach this issue of flows by examining the magnitude of losses from the active Air Force, categorizing these losses by their eligibility to join the ARC, and then matching these losses against reserve master files to see whether they enter the reserve.

This chart shows the number of active Air Force pilot losses from 1980 to 1992 distinguished by those who were and were not eligible to enter the reserves (based on interservice separation code). For example, we classified all retirements, deaths, and discharges due to medical problems, unsatisfactory performance, or conduct as ineligible. Between 40–50 percent of all losses in any given year are ineligible. During most of this period, the number of ineligibles has remained reasonably constant predominantly reflecting retirements from a consistently sized Air Force. However, the number of eligible losses has been increasing in recent years, from 1,500 in FY 90 to 2,500 in FY 92 because more separating pilots are not at retirement eligibility and thus are eligible for the ARC.

As the active AF downsizes, the size of the recruiting pool for the reserves *in the near term* is likely to become even larger.

Accession into the Selected Reserve (From Eligible Active-Duty Losses)



Typically about 40% of "eligible" active-duty losses go into ARC

- Two-fifths into the Air National Guard
- Three-fifths into the Air Force Reserve

The ability of the ARC to profit from this one-time bonanza of prior-service pilots is likely to be fairly limited, given its size and given that it routinely faces queues of people wanting to join. For example, overall the ARC has taken in only about 35 percent of all eligible losses from the AF, although in some years, 1985–1988, for example, the proportion entering was a little higher (40–45 percent). The proportion entering from the 1990 loss cohort is an underestimate—some of these individuals have had less than a year to join, because our reserve master file only goes to the third quarter of FY 91. The Air Force Military Personnel Center estimates that the average proportion entering the ARC from 1990–1992 losses will be closer to 40 percent.

In terms of actual numbers of AF pilots entering the reserve, we find that on average, when we look at losses from 1980 to 1990, about 355 pilots join. The actual numbers vary somewhat, from a low of 147 from the 1983 loss cohort to over 500 from the 1988 cohort. Presumably, these variations are at least partly explained by variations in civilian airline demand for military pilots, civilian unemployment rates, the size of the ARC, and the availability of positions in the ARC.

Overall, about 44 percent of all ARC prior-service pilot accessions are into the Air National Guard, while about 56 percent are into the Air Force Reserve. A very small percentage, less than 1 percent of AF pilot losses, enter a non-ARC Selected Reserve component.

Outline of Briefing

Background

Pilot requirements

- **What are the underlying determinants of pilot requirements?**
- **How have pilot requirements changed since 1988?**
- **How are pilot requirements likely to change in the future?**

Pilot inventory

Pilot management and training

Future policy issues

Our tasking on this first phase of research was threefold. First, we were to look at why requirements have changed, specifically what underlying factors drive those changes. Second, we were asked to look at how pilot requirements have changed since 1988 (the date of the DoD Aviator Retention Study, which was the last comprehensive work on aviator supply and demand issues). Finally, using the knowledge gained from the first question, we were to project how pilot requirements were to change in the near term.

The priorities for analysis were to examine the active Air Force first, the ARC next, then the Navy, with Naval Air Reserve last. (We did not study Marine Air or the Marine Air Reserve in any detail.) We received requisite data and information from the active AF, the AFR, the ANG, the active Navy and the Marines. In accordance with the priority guidelines laid down by our sponsors, the analysis presented is in the most detail for the Air Force.

What Are Underlying Determinants of Pilot Requirements?

DETERMINANTS	PILOT REQUIREMENTS CATEGORIES			
	FORCE	STAFF	TRAINING	MANYEAR (OTHER)
FORCE STRUCTURE	●		○	
ORGANIZATIONAL STRUCTURE	○	●	○	
POLICY CHANGE	○	○	○	○

● Strong Impact
○ Moderate Impact

Conceptual framework

- Shows *why* pilot requirements are changing
- Captures changes not yet reflected in service data

To answer the first question, we looked at the factors that were driving change. We developed three classes of determinants—force structure, organizational structure, and other policy change. Force structure changes center on the drawdown to include fewer PAA.

Organizational restructuring covers the full spectrum of internal reorganization that the services are undergoing from squadron and wing through service headquarters. Finally, there are other policy changes that affect pilot requirements, such as changes in crew ratios.

We adapted Air Force terminology and divided pilot requirements into four basic categories—force, staff, training, and manyear or other, which includes transients and students. Force requirements include all of the pilots required to man operational flying units. Training programs are necessary to ensure the operational readiness and necessary skill level of the operational units. This category includes the instructors for both formal and other training. Staff are necessary in order to provide for overhead support and supervision required to ensure safe, efficient, and productive flying operations. Finally, there are other or manyear requirements that allow for time in the training pipeline, enable pilots to participate in professional development or formal education programs, or permit pilots to take leave in conjunction with reassignment. A special category of manyear requirements, the rated supplement, has been used in the past to create requirements that allowed pilots to be assigned to other than usual pilot requirements. (This category was eliminated in FY 94.)

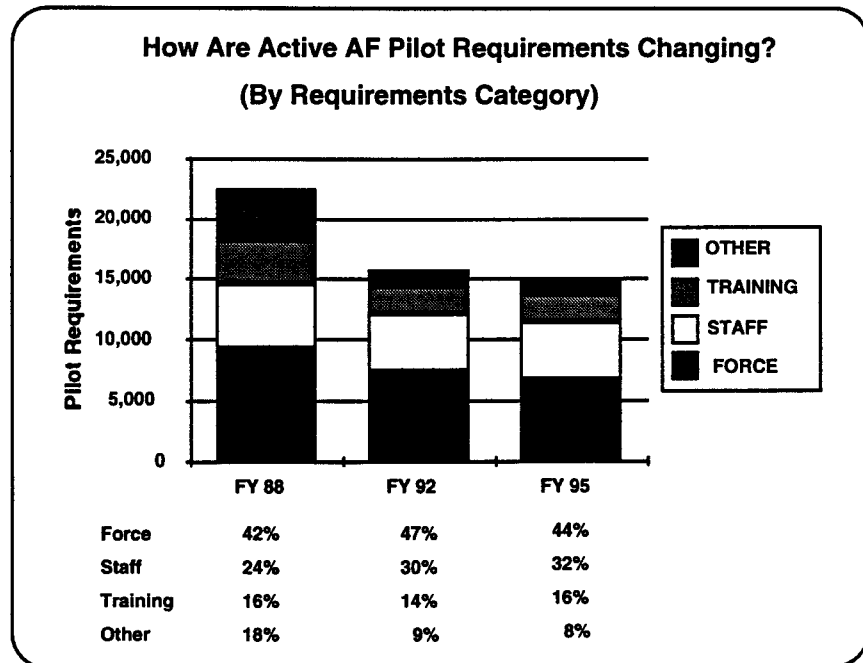
We applied this conceptual framework to the Air Force and Navy to portray the impact of the several determinants on the categories of pilot requirements. For example, force structure changes will have a strong and immediate impact on force pilot requirements, with a more moderate impact on training. Such changes do not necessarily have any impact on staff requirements, however. Changes in organizational structure create the major impact on staff pilot requirements.

This conceptual framework can be used to show why pilot requirements in the various categories are changing. Additionally, the framework allows us to estimate changes in pilot requirements that are not yet reflected in service data. There are policies that have been decided on and worked out on paper, but whose effects have not yet shown up in databases because of administrative procedures. We can use the framework to show how requirements are likely to change.

In the following charts we will summarize our March 1993 analysis for each category of pilot requirements.³ FY 88 is used as a base year because it was free of turmoil created by the Persian Gulf Conflict and post-cold war drawdown policies. FY 92 (although we are now past this) represents present requirements. FY 95 represents future requirements as estimated or projected by the service as of early 1993. We will then evaluate whether the effect of the determinants are fully reflected in the projected data for FY 95. (Later we will use the results of this evaluation to estimate FY 97 requirements as the basis for longer term assessments.)

It is important to recognize that we are analyzing requirements and their sensitivity to the various determinants over time. We are not validating requirements. Additionally, the data we are using are in constant flux. We fix the data at points in time in order to draw conclusions. For each service, we portray pilot requirements by the four basic requirements categories (force, staff, training, and other) and by major weapon system.

³The complete analysis of requirements is found in unpublished RAND research by Claire Mitchell Levy, William W. Taylor, Harry J. Thie, and Sheila Nataraj Kirby on determinants of pilot requirements.

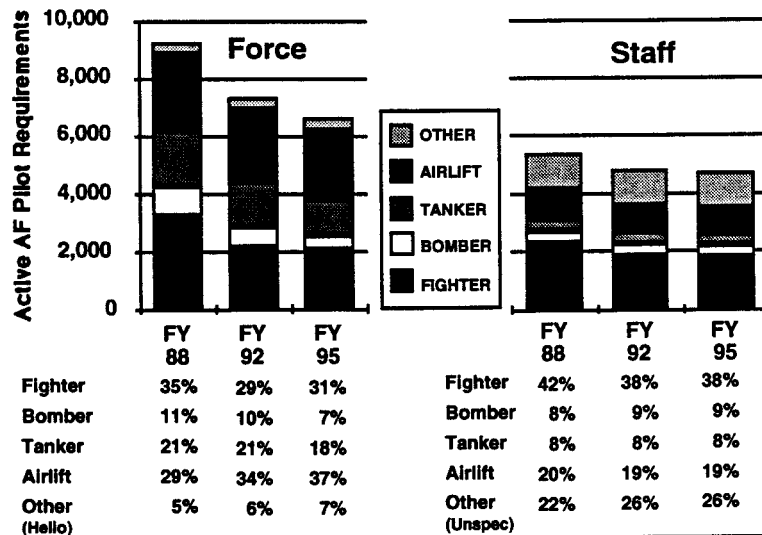


From 1988 through 1992, active Air Force pilot requirements were reduced by roughly 30 percent. In 1993, the Air Force projected an additional 6 percent reduction by 1995. The bulk of pilot requirements are allocated to force and staff categories. In terms of numbers and share, training and other categories have the largest reductions in pilot requirements. Over 4,200 pilot positions are eliminated in these groups by 1995, compared with slightly more than 3,200 for staff and force. The share of staff requirements increases by 8 percentage points between FY 88 and FY 95.

Under current plans, the bulk of the reductions in pilot requirements planned by the Air Force will have been implemented by 1992. There are two developments, however, that do not appear in the data. First, only current force drawdown plans, defined as the Base Force, are reflected. Second, Air Force reorganization plans are only in the beginning stages of implementation.

We next examine how pilot requirements are changing by major weapon system for the force and staff categories, which are, by far, the largest categories.

How Are Active AF Pilot Requirements Changing?



Force requirements are the flying positions in operational units and are subdivided into crew ratio and non-crew ratio. Crew ratio requirements, which compose 84 percent of the force category, are calculated for combat-coded PAA based on the crew ratio required to ensure wartime sustainability (adjusted downward by the service as a result of peacetime budgetary constraints). Non-crew ratio requirements include pilot supervisors such as squadron operations officers and commanders as well as those engaged in test and evaluation. Crew ratio requirements are decreasing in line with PAA reductions, which are being reduced in the Base Force by about one-third between FY 88 and FY 95. Certain major weapon systems, such as fighters and bombers, will bear a greater proportion of the drawdown burden. Airlift will have a growing role in the future.

Staff requirements include management and operational staff positions at all levels of command. Some positions require flying, and some do not. The largest portion of staff pilot requirements is for fighter pilots. The second largest portion is unspecified, which generally means that any experienced pilot could fill the position. Such requirements provide some flexibility in matching inventory to requirements but can cause planning problems if pilots in a particular major weapon system are used disproportionately in these unspecified positions. We review the effect of manning unspecified positions with pilots in certain major weapon systems when we examine policy options.

Assessment of Active Air Force Pilot Requirements

<u>Category</u>	<u>Determinant</u>	<u>Assessment</u>
Force	Force Structure	Consistent with PAA reductions
Staff	Organization	Reorganization not fully reflected
Training	Policy	Reductions higher than expected
Other	Policy	Reductions higher than expected

We estimate a further 10 percent force reduction by FY 95

We estimate a further 20 percent staff reduction by FY 95

Our research found somewhat different patterns in force and staff categories of requirements by 1995 from those indicated by the Air Force. This is primarily due to the fact that not all planned changes, especially staff, have been incorporated into the Air Force's official database. An examination of the underlying determinants that drive changes in pilot requirements provides some window into what these future requirements are likely to be.

Force requirements, which are driven by the crew ratio subcategory, are a direct function of force structure (PAA times crew ratio). This category was projected by the Air Force in 1993 to go down by 34 percent, which is similar to the cut in PAA in the Base Force. However, we estimated a further 10 percent cut in PAA as a result of the Bottom-Up Review (and thus in crew ratio force requirements), which would be consistent with the 1992 Aspin Option C force structure.¹ (At the time our estimates for FY 95 requirements were made, the Bottom-Up Review was not complete. However, a level of PAA consistent with the earlier assessment seemed reasonable.)

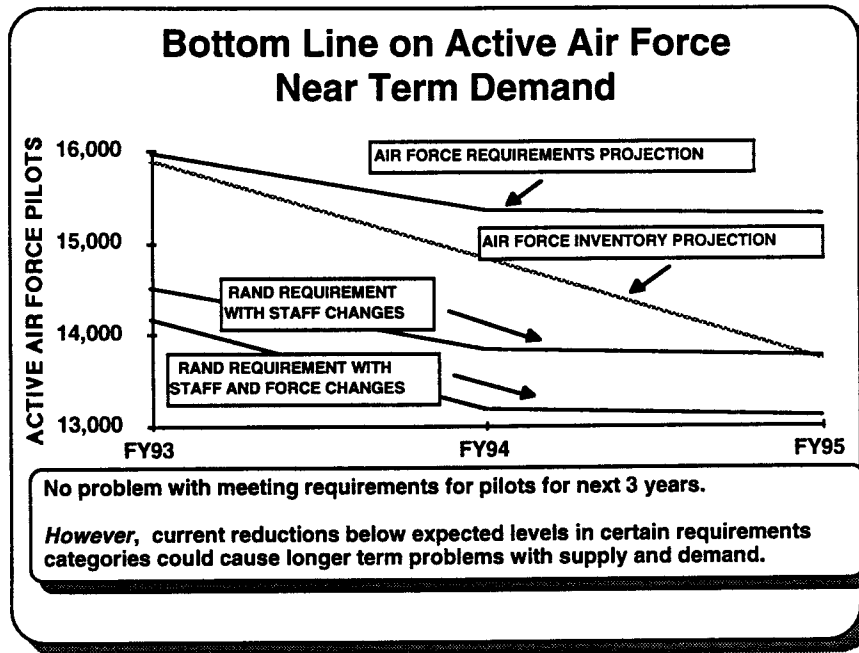
¹While Chairman of the House Armed Services Committee, Congressman Les Aspin proposed several possible options for future force structures. Option C is widely viewed as the blueprint for the Bottom-Up Review.

Staff requirements do not appear to fully reflect the ongoing Air Force reorganization. In particular, reductions of wing and below wing flying staff of 15 percent do not reflect the projected reductions from the new objective wing nor the reduction in the number of wings. Above-wing flying staff reductions of 11 percent do not reflect all of the changes in commands such as reductions in the number of Major Commands (MAJCOMs), elimination of air divisions, and reorganization within these levels of command. Nonflying staff positions, both above and below wing level, show an increase in pilot requirements that is not likely to be sustainable. Overall, we would expect staff requirements to go down by an additional 20 percent relative to the Air Force estimate when all organizational changes are reflected in databases.

Training reductions appear to go beyond current Base Force levels, perhaps in anticipation of further force reductions. If greater force reductions do occur, there could be continued reduction in training requirements due to additional overages in existing pilot inventories. This short term response must eventually reverse itself, however, when training levels become too low to ensure sufficient throughput to meet future requirements for experienced pilots. This issue of how many to train is examined later as a policy issue.

In the other or manyear category, the rated supplement goes away as a requirement in FY 94. Some other subcategories, although small, may have been disproportionately reduced. It is not clear how the new volunteer assignment system will affect moves among inexperienced pilots on initial operational assignments (tour lengths should increase) or experienced pilots (while tour lengths should remain close to present levels, they probably will not).

Overall, we estimate FY 95 requirements to be lower than what the Air Force projects by a total of about 14 percent—10 percent in further force reductions and 20 percent in staff requirements reflecting decisions already made about reorganization.



To summarize, we now present the Air Force's 1992 projection chart for FY 95, but with two additions as outlined previously:

- our 1993 estimate of requirements when the 20 percent staff cuts are fully reflected
- our 1993 estimate of requirements with both the full staff cut and a 10 percent cut in force requirements.

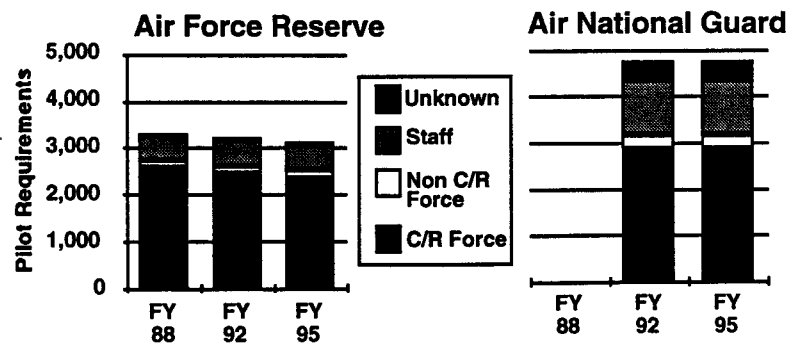
Using the Air Force 1992 inventory projection, we foresee no near term problem in meeting pilot requirements, although some of the changes in requirements today may exacerbate or cause long term problems. (In a succeeding section, we will use our determinants framework combined with recent known changes (e.g., 10 percent force cut) to specify an FY 1997+ steady-state objective profile of pilot requirements. We will use this profile to compare to our inventory projections for longer term future years and to analyze if there are imbalances by years of service, even if there is not an overall shortage of pilots.)

We need to point out that the work thus far

- has not looked at the plausibility of the inventory line
- has not examined requirements in a total force context.

Air Force-ARC integration, we believe, will be critical in the future; we show some reasons why later in the briefing. Next we will examine ARC requirements and, after that, Navy requirements.

How Are Air Reserve Components (ARC) Requirements Changing?



Requirements are principally driven by force structure changes.

Some changes to ARC missions, but overall levels of pilot requirements are not greatly reduced from FY88 to FY95.

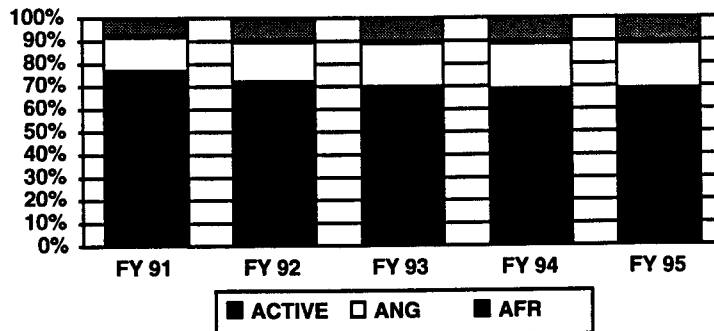
Pilot requirements for the ARC are relatively straightforward given the current arrangements of accessing and training.

AFR pilot requirements occur only in force (82 percent) and staff (18 percent) categories. Force structure is thus the principal determinant for AFR requirements. Staff requirements are a function of the organizational structure of both the AFR and the active Air Force because certain staff functions are performed only by active pilots, allowing a leaner overhead for the AFR.

Force structure and wing structure are the principal drivers of ANG requirements. Pilot requirements are expected to remain fairly constant for the ANG through FY 95. Crew ratio force requirements are 60 percent of ANG pilot requirements in FY 92. Staff requirements for the ANG occupy a larger portion of total pilot requirements (25 percent) than for the AFR. An additional 400 pilot requirements are not attributed to a particular category.

There is little change between FY 92 and FY 95 in actual requirements, but this does mean that there is a larger relative change between active and reserve as the active Air Force draws down. Potentially these changes could affect the calculus of ARC pilot requirements beyond FY 95 by raising overhead requirements, by changing the mix of pilots required by major weapons system, or by introducing major weapons systems that are not now in the ARC.

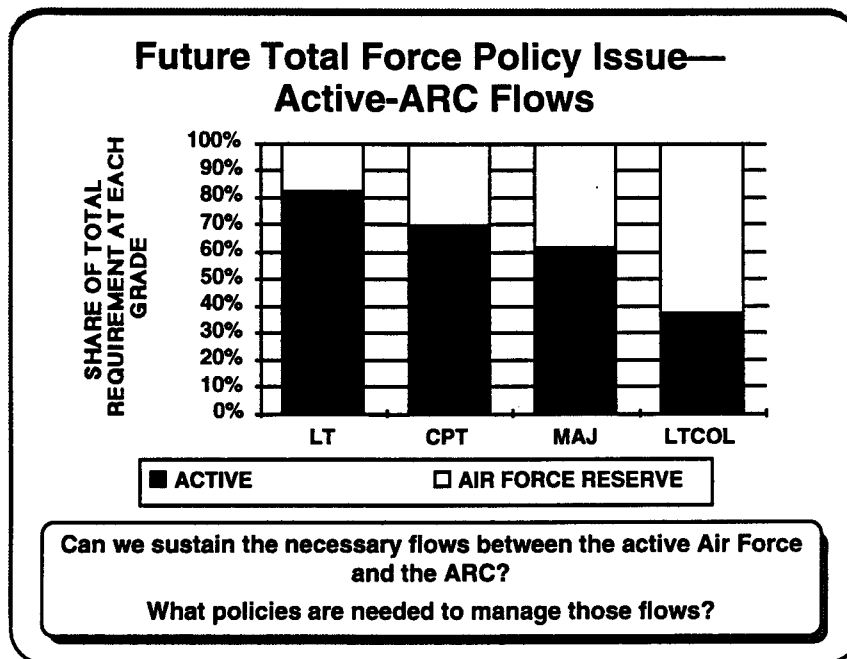
Total Air Force Pilot Requirements— Active-ARC Mix



The Active-ARC mix is moving toward an overall 65/35 split, with a 50% share of pilots in operational billets.

Overall, the total Air Force is moving to a 65 percent active and 35 percent reserve force mix but with 50 percent of operational (crew ratio) billets occupied by ARC pilots.

This shift could cause future problems because the two components are not mirror images of one another. On the requirements side, pilot needs are defined in comparable ways (e.g., you need an experienced (major) bomber pilot) because similar unit manning documents are used. On the inventory side, less comparability exists—e.g., the ARC and active components have very different personnel systems and experience profiles. Moreover, category structures (force, staff, and training) have very different proportions between the two components.



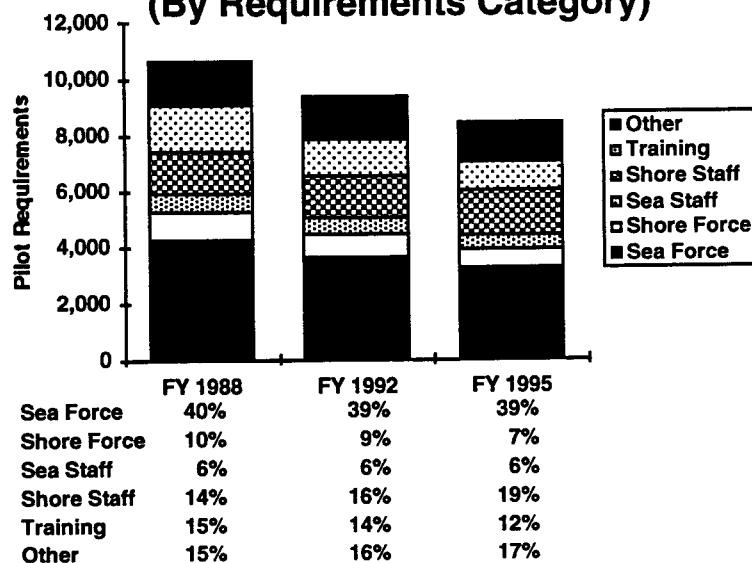
For example, the grade structure is very different in the active component and the ARC. Is a much smaller active Air Force sufficient to sustain the ARC with pilots in the aggregate or by major weapons system? Does the need for pilot flow to the ARC conflict with the active Air Force need for retention?

Flows of pilots across components and to civilian airlines need to be examined carefully, with consideration of potential policies to manage these active and reserve flows.

We examine these issues later as we examine retention and other policy issues. They are predominantly Air Force issues because the Naval Air Reserve is not a high proportion of total Navy pilot requirements and is being reduced in size along with the active Navy. Additionally, the Naval Air Reserve has had and is expected to have sufficient supply of pilots for any likely future scenarios.

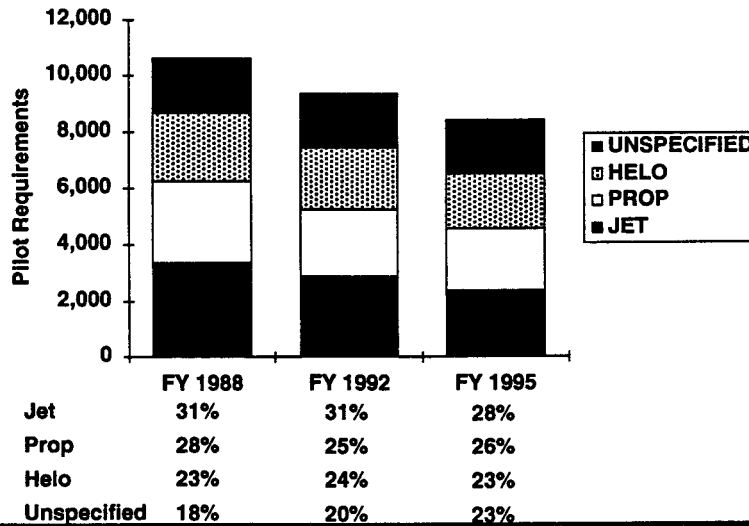
We next examine the requirements for pilots in the Navy.

How Are Navy Pilot Requirements Changing? (By Requirements Category)



Force structure reductions tend to be more quickly reflected in force pilot requirements numbers with cuts in staff, especially shore staff, lagging behind. In particular, shore staff is growing between FY 92 and FY 95, which leads to staff having a larger share of pilot requirements in FY 95.

How Are Navy Pilot Requirements Changing? (By Major Weapons System)

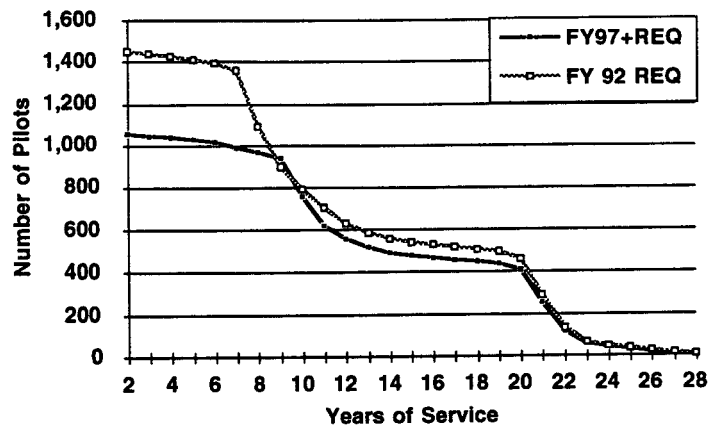


In general, force structure changes will reduce the number of jets (e.g., F/A-18 and F-14) by about 27 percent, props (e.g., P-3) by 37 percent, and helos by 23 percent.

Pilots allocated to these major weapons systems at various time periods are shown in the chart. Included in the unspecified category are aviation generalist positions (positions that could be filled by any experienced pilot) and unrestricted line billets (1,000/1,050) that are expected to be filled by pilots. In general, the allocation to each system tracks with how the systems are being reduced, but, as with the Air Force, we believe that not all pilot reductions have been reflected in Navy requirements data for pilots.

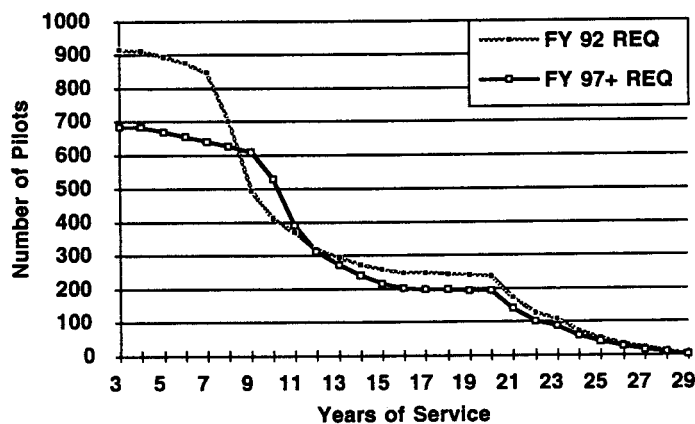
We estimate that there could be a 12 percent further reduction in the total number of pilot requirements if the staff category were aggressively reviewed. Without such a review, we estimate about a 3 to 4 percent reduction will actually be realized. This latter estimate will be used in our assessment of FY 97+ Navy pilot requirements.

Air Force Requirements Objective Has Changed



Since we ultimately want to compare future inventories of pilots with requirements for them for the Air Force and Navy, we used our evaluation of Air Force and Navy pilot requirements to estimate objective profiles for those requirements in the steady state (FY 97+). These profiles convert data by grade to data by years or length of service. We use them as an objective that policies for pilot management and training are trying to achieve. Such policies cause changes in inventory profiles that can then be compared with the requirements profiles to see whether and if the objectives are being met.

Navy Requirements Objective Has Changed



Outline of Briefing

Background

Pilot requirements

Pilot inventory

- **What are the factors that influence pilot inventories?**
- **What will pilot inventory be in the future?**

Pilot management and training

Future policy issues

As previously discussed, we developed our own assessment of Air Force and Navy requirements for FY 95 and beyond based on force structure levels specified in the Base Force. We later modified these estimates for FY 97 and beyond to incorporate the knowledge of force levels we had at the time of the Bottom-Up Review. We did this by using the determinants and procedures documented earlier in this report.³

This section addresses a number of questions about inventory management for the active Air Force and active Navy. As mentioned earlier, the major focus is on the Air Force.

³We incorporated our 10 percent projected reduction in force requirements for the Air Force in the FY 97 requirements estimate because it had occurred. We did not incorporate our 20 percent projected reduction in Air Force staff requirements because it had not occurred. Our purpose is to assess the effect of policies on inventory levels, so we used a level of requirements numerically consistent with that of each service.

What Factors Influence Pilot Inventory?

- **Production**
- **Distribution**
- **Absorption capacity**
- **Retention**
- **Assignment and promotion policies**

Pilot inventories are influenced by the following factors:

- production
- distribution
- absorption ability
- retention
- assignment and promotion policies.

Many of the terms in this section are adapted from the Air Force's *Rated Management Document*,⁴ where they are fully defined. The same factors also influence Navy and Marine Corps pilot inventory behavior.

⁴*Rated Management Document*, April 1993, pp. 9-1–9-5.

Production. The annual rate of graduates from UPT. This factor is closely related to *UPT accessions*; the differences are due to attrition during UPT.

Distribution. The assignment of new (and other non-MWS identified) pilots to the actual pipeline training, which establishes major weapons system (MWS) credentials.

Absorption ability. The number of new and previously qualified pilots that each MWS group can accept each year. This factor is influenced (or constrained) by several policy issues and other parameters. These include

- Experience: Two components are incorporated in this parameter. The first establishes criteria in terms of minimum flying time and/or time in crew position required for a crewmember to be identified as experienced in a given MWS. The second determines minimum proportions of aircrew authorizations (by flying unit), which must be filled by crewmembers who meet these criteria and are thus identified as experienced.
- Stability goals:
 - Permanent change of station (PCS) stability: length of time at one base prior to PCS move.
 - Weapon system stability: length of time flying a particular weapon system.
 - Aircraft commander stability: length of time in aircraft after upgrade to aircraft commander.
- PAAs and crew ratios (by MWS): all absorbing cockpits are part of the crew ratio force.
- Vacancies in absorbing units, or the number of *absorbing cockpits*.
- Pipeline (i.e., post-UPT) training capacity (by MWS).
- Loss rates and retention (which are, in turn, affected by a number of other factors).

Absorption capability clearly influences (and constrains) distribution and number of new pilots to be produced each year.

Retention. A measure of the likelihood of pilots to continue from year to year in the pilot inventory. This factor is determined by *loss rates*, which give the percentage of a cohort population that is lost from the inventory in a given year. Forced retention has traditionally been legislated in the form of a minimum active-duty service obligation (ADSO) following the completion of UPT. The current ADSO is eight years. Voluntary retention can be influenced by promotion, compensation (such as Aviation Career Incentive Pay and Aviation Continuation Pay), quality of life, and other factors such as airline demand (together with salary and job security forecasts) or opportunities in the ARC.

Assignment and Promotion Policies. These factors have a significant effect on absorption ability and retention. Officers can also be promoted out of the pilot inventory, which only includes grades O-1 through O-5.

Interaction of the Factors. These factors dynamically interact to complicate real-world inventory management. For example, the Air Force has moved over time from accessing pilots to sustainment levels, to accessing pilots to absorption ability, and finally to a vacancy-driven system as the factors have changed. This is discussed in more detail below.

Historically, the Air Force used a *sustainment model* to determine pilot production requirements, since its primary concern was to set pilot production high enough to sustain the inventory at levels that met or exceeded pilot requirements. Then in the 1970s, inventory managers recognized that this production rate coupled with reductions in absorbing cockpits had caused the proportion of experienced crewmembers to drop below minimum levels in operational units. The Air Force next adopted an *absorption model*, which it used until it became clear that PCS stability had dropped to the point (15–18 months for continental U.S. fighter units) where retention was seriously threatened. Multiple initiatives (some monetary, and others in promotion and quality-of-life categories) raised pilot retention to its highest levels in history in the mid-1980s, immediately before the drawdown. Then the abrupt transition into the drawdown mode, coupled with firm commitments to UPT inputs and the implementation of the Officer Voluntary Assignment System (OVAS), created pilot production overages, which required pilot banking and other severe management measures. This led the Air Force to also incorporate a *vacancy-driven model* (based on OVAS) in inventory management. An effort, based on this model, to eliminate the pilot bank and produce a rapid return to more traditional inventory dynamics places significant constraints on UPT production through FY 97.

Since OVAS will provide certain officers the opportunity to “camp out” in desirable flying billets while others are trapped outside their desired billet, assignment behavior must be modulated with internal policy options, and the Air Force hopes to accomplish this using promotion expectations. Certified *Pilot Career Paths*, which tie promotion opportunity to assignment selection, have already been defined and publicized. The *Fly Only* career path, for example, projects a modal top grade of major for those “who perform well . . . and a few may be promoted to lieutenant colonel,”⁵ whereas the *Staff and Operations* career paths project jobs for colonels and the *Leadership* career path mentions “. . . consideration for general.”⁶ Hard-to-fill flying jobs, such as formal school (UPT or Replacement Training Unit [RTU]) instructor billets have been conspicuously positioned in the Career Path Experience Matrices contained in the pamphlet. It is interesting to note that “Formal School IP” is listed as *essential* for promotion to lieutenant colonel for every MWS (except tankers, where it is described as merely *desirable*).

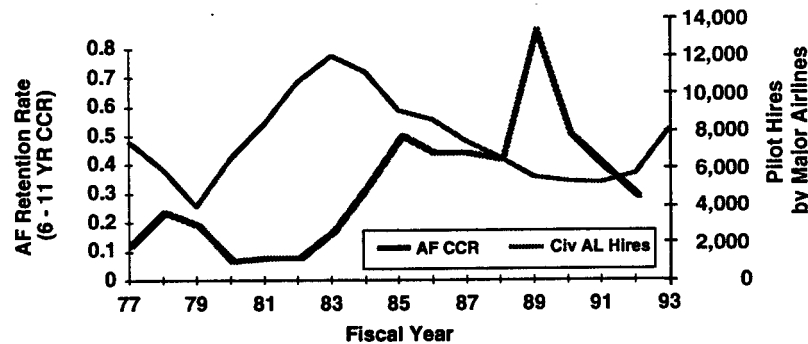
Of all of the factors listed earlier—production, distribution, absorption ability, retention, and assignment and promotion policies, retention has often been asserted to be the most important factor in the pilot supply-and-demand equation.

⁵*Pilot Career Paths*, Draft, Air Force Military Personnel Center pamphlet, June 1993, p. 2.

⁶*Ibid.*, p. 3.

Retention Is One of the Key Factors Affecting Pilot Inventory

Civilian airline hiring is often cited as the central problem in management of U.S. military pilots, specifically with respect to retention.



How is retention affected by civilian airlines? This chart shows the downside of the military-civilian airline industry relationship. Civilian hiring of U.S. military pilots is often cited as the central problem in management of U.S. military pilots, specifically with respect to retention.

Historical data from the 1988 DoD Aviator Retention Study gives some support to the assertion that there is a reciprocal relationship between civilian airline hiring and retention. However, since 1988, as shown above, the relationship is not clear.

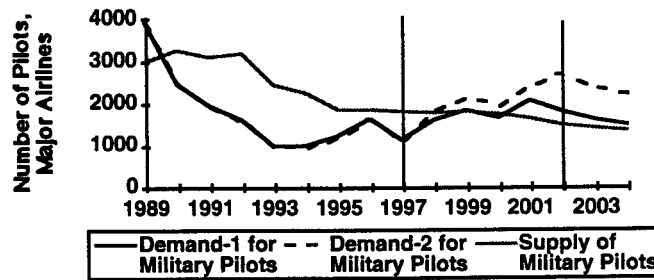
This chart shows Air Force retention data measured in terms of the 6–11 year CCR,⁷ plotted against civilian airline hiring, as reported by the Future Airline Pilots Association. The hiring data include national, major, regional jet airlines, as well as cargo airlines such as Federal Express.

In the late 1970s, airline hiring went up, and retention dropped precipitously. Airline hiring began to decline in 1978 and remained low through 1982. This is the time period when retention went from its all-time low of 25.7 percent in 1979 to an all-time high of 77.6 percent in 1983.⁸

⁷As mentioned earlier, this has been a traditional measure of effectiveness for retention of military pilots, albeit a controversial and inadequate one.

⁸A more complete analysis of the interaction between civilian airlines and military pilots will be available in a forthcoming RAND publication by Claire Mitchell Levy on civilian airline industry's role in military pilot retention.

Is There a Problem?



No problem in the near term—plenty of military pilots to satisfy demand

- Demand side — depressed airline hiring through 1997
- Supply side — pent-up supply of military pilots due to drawdown

Possible problem beyond 1997—depends on civilian airline hiring criteria and use of other supplies of pilots

- Demand side — airline hiring picks up due to Vietnam era retirements, modest growth as airline industry recovers
- Supply side — supply of military pilots is down and pool 'expires'

Is there a future problem?

In this chart we provide a breakdown of new hires based on their origins—military or civilian. For historical data, we use actual data from the Future Airline Pilots Association. For future projections, we assume that (1) the airlines will continue to hire larger shares of military pilots through the drawdown, because of their availability; (2) once the drawdown is complete and the pool of available military pilots has begun to dry up, the airlines will turn increasingly to civilian-trained pilots for new hires. This latter assumption is consistent with the findings of the Pilot and Aviation Maintenance Technician Blue Ribbon Panel.¹

Two alternatives are presented that bound the demand for military pilots. In both cases, we assume that major airlines will continue to hire military pilots at historically high levels through 1997 with 75 percent of new hires drawn from military separations. After that, in one case we assume that the portion of demand filled by military pilots will be as low as 40 percent, a rate near the historically low hiring rate of 1984. In the second alternative, the portion of demand filled by military pilots is 60 percent of new pilot hires, which is closer to the historic average.

¹The "blue ribbon panel" is a Federal Advisory Committee sponsored by the Department of Transportation that addressed congressional concern over an apparent shortage of well-qualified pilots in the United States. Federal Aviation Administration, *Pilots and Aviation Maintenance Technicians for the Twenty-First Century: An Assessment of Availability and Quality*, August 1993.

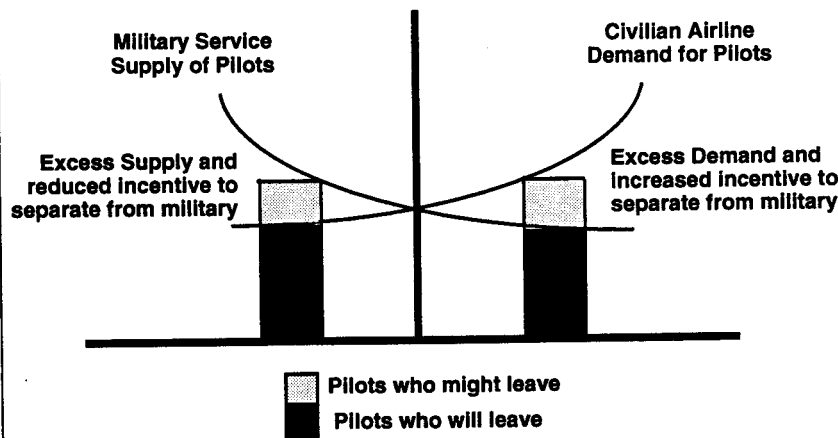
In the near term, there are plenty of military (and other) pilots to satisfy civilian airline demand through the end of the drawdown in 1997 even assuming high proportions of separated military pilot hires. There are several factors that drive this. On the demand side, the airline industry will continue to struggle through the end of this decade,⁹ with depressed hiring. On the supply side, a large number of pilots will be separating from the military in order to reduce our forces to their post-cold war levels.

We then look at the midterm, which we define as the period from 1997 through the year 2002. This period will be characterized by increased airline hiring, although the levels should still be relatively moderate by historic standards. Factors that will drive this include retirement of Vietnam era pilots brought on during the hiring surge of the 1960s and the recovery of the airline industry, which will result in moderate growth. Concurrently, this midterm period will see a reduced supply of military pilots to civilian airlines as the pool of "pent-up" supply dries up and the supply of military pilots ratchets down. Supply data are for the USN, USAF, and USMC.

Is there a problem where demand will outstrip supply? It depends on the alternative being considered. We think that the midterm more closely resembles the short term than the long term, but we cannot be sure. With demand 1, there is no problem; with demand 2, there is a problem, but it may not be a significant one until the year 2002. At that time, we believe that the precipitous drop in the supply of separating military pilots will be a problem in meeting civilian airline demand for military pilots. This could also be a serious concern for the Air Reserve Component, many of whose pilots are able to affiliate because they fly for airlines.

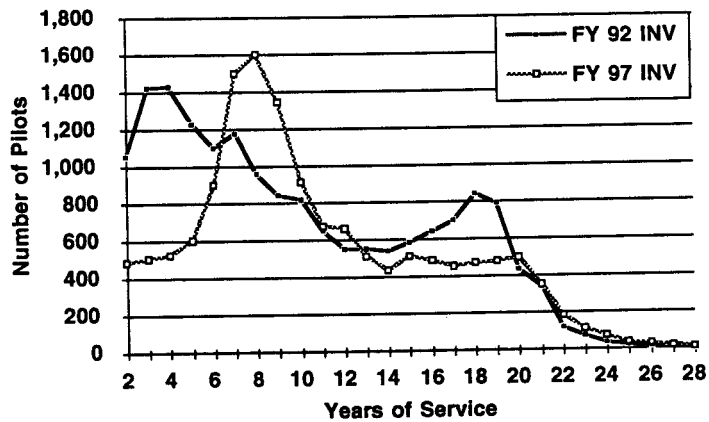
⁹Factors that drive this include increased competition from foreign carriers, increased competition from new technologies that will decrease demand for air travel, reduction in the anticipated Vietnam-era retirements bulge due to airline bankruptcies, and cutbacks in aircraft orders by many airlines through the end of the century. See, for example, "Apples and Oranges? Comparisons of the Airlines," *Career Pilot*, March 1993.

Pilot Retention Behavior Is Influenced by Civilian Airline Hiring



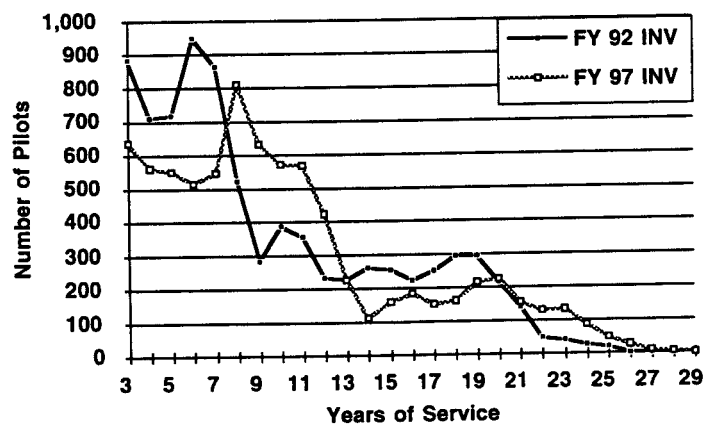
This chart shows the dynamics of supply and demand. To the left of the solid vertical line is the situation that we believe is likely through 1997. The number of military pilots who will separate is more than sufficient to satisfy airline demand. While additional pilots could separate, there is reduced incentive for doing so. To the right of the solid line is the situation that we believe is likely to exist beyond the year 2002. There will be the incentive of airline hiring for the group of pilots who may separate. Moreover, the actual number of pilots in the military will be much smaller than in the year 1997 because of reduced UPT training in the 1990s. Between 1997 and 2002 one might argue for either case being true because of the uncertainties we outlined previously.

Air Force Inventory Is Changing Because of These Factors



All of the factors described earlier interact to affect the inventory of pilots. These two charts present what we consider to be our best estimate of how these factors will play out to affect and shape the inventory profile. The charts show the projected FY 97 inventory of active pilots against the actual FY 92 inventory for both the Air Force and the Navy. Rather than discuss these in detail here, we turn to the next section, which superimposes requirements against our projected inventory and highlights what kind of problems the services are likely to face.

Navy Inventory Is Changing Because of These Factors



Outline of Briefing

Background

Pilot requirements

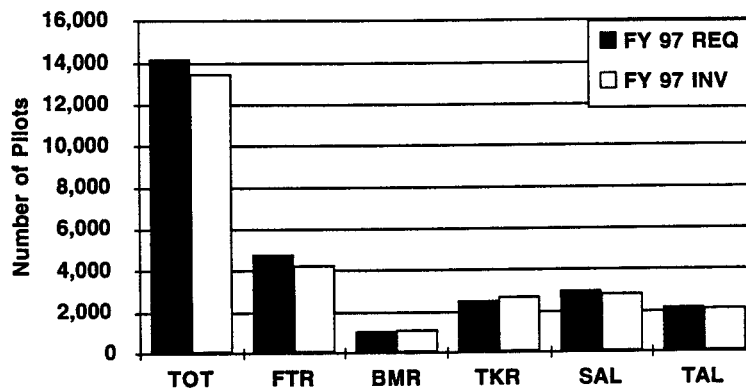
Pilot inventory

Pilot management and training

- **Are there problems meeting pilot requirements?**
 - Is there a numeric problem?
 - Is there a major weapons system (MWS) problem?
 - Is there an experience problem?
- **What policy options can counter problems?**

Future policy issues

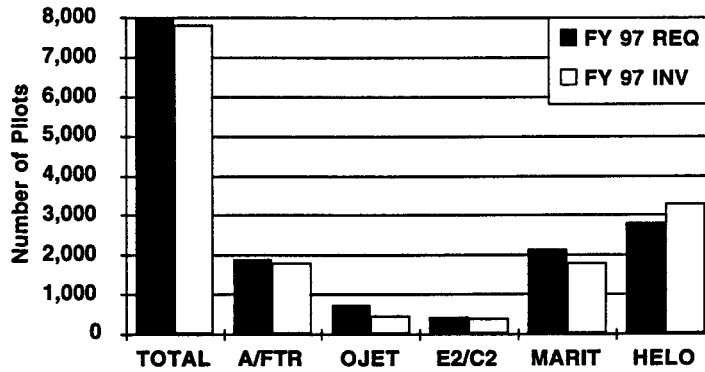
No Critical Numerical Shortages Exist in Any Air Force MWS Through FY 1997



This chart compares our estimate of Air Force FY 97 inventory with requirements both in the aggregate and by MWS. There are no shortfalls anywhere prior to FY 97, although shortages do start to occur in FY 97. These shortages (approximately 700 total pilots, of which over 500 occur in fighters) are not *critical*. By critical, we mean less than 5 percent short and able to be resolved without major policy initiatives. In fact, the shortages are directly attributable to policy decisions to reduce the pilot inventory in 1992 and 1993 during the drawdown through “non-normal” losses due to Voluntary Separation Incentive/ Selective Separation Bonus, early retirement, bonus excusals, involuntary separations, and other initiatives.¹⁰ The following discussion about experience distributions will illustrate that such decisions, even though they created some non-critical numerical shortages by FY 97, are useful in minimizing longer term experience maldistributions. In essence, less current retention will be better for the future.

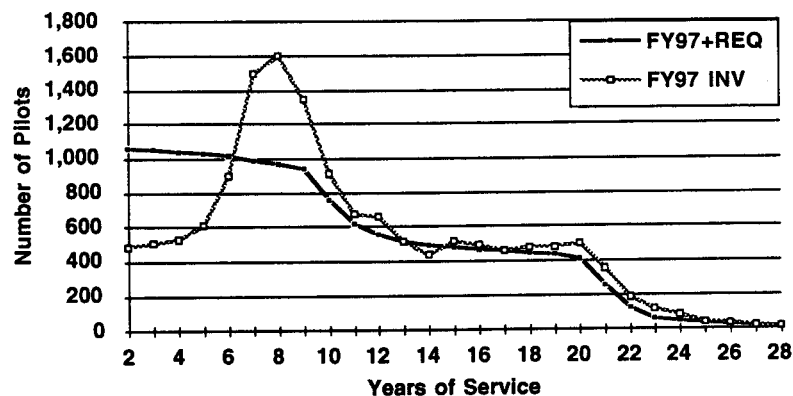
¹⁰The data shown here reflects results obtained using end-FY 93 inventory (which includes non-normal losses) as the starting point. In later projections, we included only normal losses based on expected retention behavior. Given the inherent uncertainty of inventory projections through FY 2002, numerical results could be somewhat different, and we will highlight the differences. These data differences do not change our assessment. Our projection uses the current Air Force Pilot and Navigator Distribution Plan (AF/XOOT Letter, 27 September 1993) to fix UPT production and MWS distribution through FY 97 and assumes that these parameters subsequently are fixed at steady-state sustainment levels.

No Critical Numerical Shortages Exist in Any Navy MWS Through FY 1997



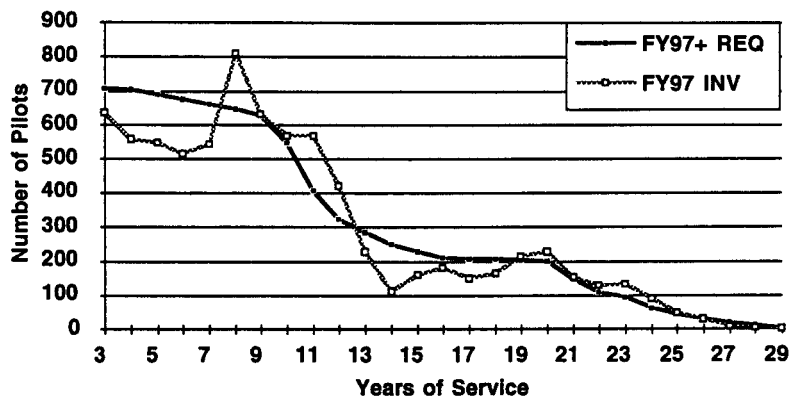
A similar assessment for the Navy produces a similar finding. Indeed, the Navy situation in FY 97 appears to be significantly improved over that of FY 92, when significant numbers of helicopter pilots and Naval Flight Officers were required to fill the Aviation Generalist (15XX) billets. These projections are based on Navy generated UPT production rates (which include MWS distributions) through FY 97. (In the chart, A/FTR = attack/fighter, OJET = other jet, MARIT = maritime, and HELO = helicopter.)

Air Force Experience Maldistribution in FY 1997 Is No Problem



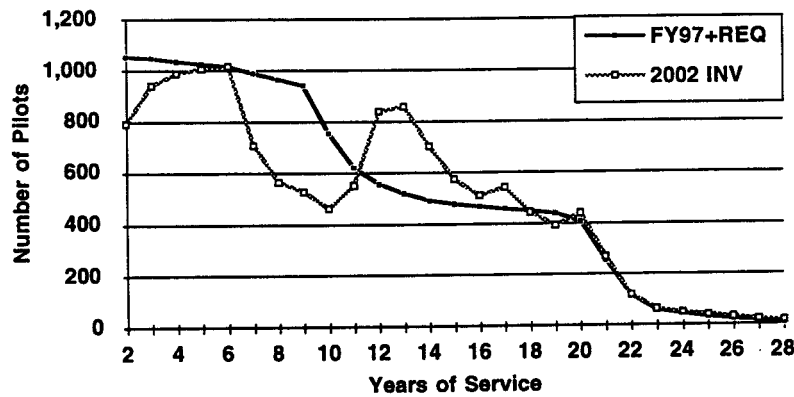
This chart provides a year-of-service (YoS) comparison of the FY 97 inventory projection with the corresponding requirements objective profile for that year. Although the comparison confirms a significant experience maldistribution, the shortfalls occur in the initial cohorts in the profile (YoS 2 through YoS 5), while corresponding overages are generated in the YoS 7 through YoS 10 cohorts. We confirmed similar experience profiles for the individual MWSs. This experience maldistribution generates no immediate operational problem, since shortages occur among the least experienced (and presumably least capable) pilots, and the overages occur among those cohorts who typically represent the heart of operational flying experience (i.e., the vast majority of instructor pilots, flight examiners, and other inflight supervisors are taken from these senior company-grade cohorts). A complete assessment, however, must also consider the dynamic behavior of the inventory. What is the potential operational impact as the cohorts who are in shortage age to where they would normally assume increased flying responsibilities? To examine this issue, we continued our projection model for another five years (into the "outyears"), and we assumed that outyear requirements were unchanged (so that the same requirements objective profile could be used from FY 97 on).

Navy FY 1997 Experience Distribution Shows No Major Problem



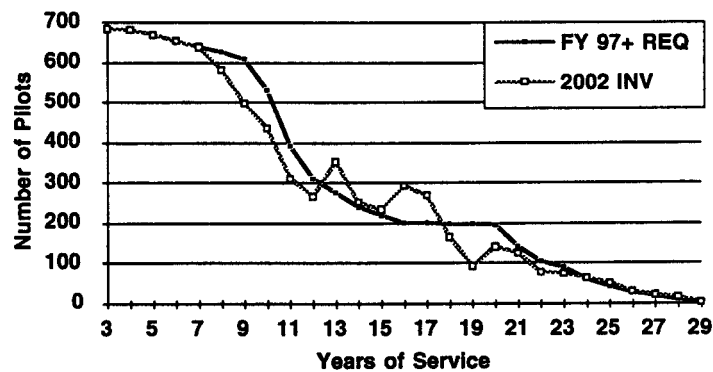
The Navy's projected experience distribution for FY 97 conforms far more closely to the requirements objective profile than does that of the Air Force. Ironically, the Navy's higher attrition experience prior to 10 years of service (due to shorter active-duty service obligations and lower natural retention) allows the Navy to avoid the significant overages encountered by the Air Force in the YoS 7 through YoS 12 cohorts and enables the Navy to maintain reasonable UPT production levels throughout the drawdown period, which will help avoid future cohort shortfalls.

In 2002, Air Force Has a "Bathtub" and 800 Pilot Inventory Shortfall



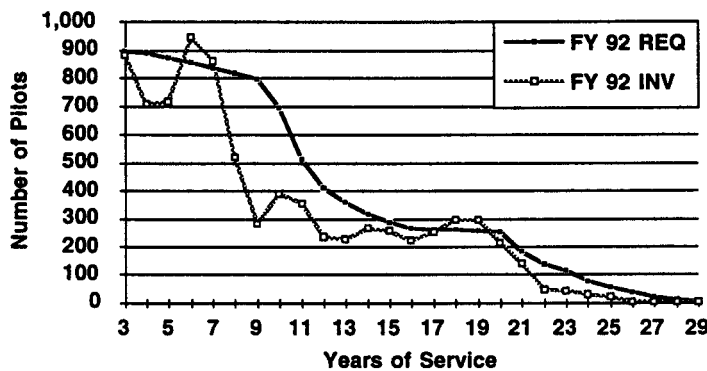
This chart confirms that the damaged cohorts will generate a "bathtub" effect in the inventory by FY 2002, and it also establishes that inventory shortfalls will occur by that time. The shortfall shown represents some 800 Air Force pilots, but it could increase to nearly 1,200 pilots because of the additional non-normal losses taken in FY 93. In either case, the policy assessments are similar. Individual MWSs reflect similar patterns to those exhibited by the total inventory, though these patterns are less pronounced in every MWS except fighters.

In 2002, Navy Has No Major Problems



Alignment of inventory and requirement distributions for the Navy in FY 2002 is remarkably close. Indeed, an overall 300 pilot shortage is a significant improvement over the pre-drawdown situation in FY 92, in which a numerical shortage of 2,000 pilots existed. (Some drawdown losses probably occurred in FY 92 inventory that were not reflected in requirements.) There are several options available to obtain the slight retention improvements required to match the requirement numbers, and there is also a possibility for requirements to continue to drop in the outyears, especially in the staff category.

In Fact, Navy Will End Drawdown In Better Shape Than They Entered



This leads us to the following preliminary conclusions.

Preliminary Conclusions

- **No critical inventory shortages occur in ANY MWS through FY 1997**
- **Inventory shortfalls begin in FY 1998 and continue through the outyears (for constant requirements)**
- **A maldistribution of inventory experience (the “bathtub” effect) also occurs during the outyears in the Air Force**
- **Severity of these problems depends on policy responses available**

The conclusions are somewhat conditional, because as we point out above, the severity of problems in the outyears will be critically dependent on the potential policy options that might be employed to counter the indicated problem areas. We need to examine what options are available and how successful they might be in mitigating or alleviating these problems. We first address the inventory shortfall problem. We focus on the Air Force for the remainder of our analysis. Many of the policy options, of course, apply equally to the Navy, although we do not forecast problems for them.

Here is a list of alternative policies to counter the outyear inventory problems that are predicted in the Air Force. Some of these deal with increasing inventories and some look at reducing requirements; one looks at both sides of the equation.

Alternative Policies To Counter Outyear Requirements/Inventory Mismatches

Policies	Policies Affect...
1. Access to requirements	1. Inventory
2. Optimize UPT production	2. Inventory
3. Reexamine UPT Instructor Pilot policies	3. Inventory and Requirements
4. Redistribute unspecified requirements	4. Requirements
5. Increase retention	5. Inventory

We describe each of these policies in some detail in succeeding charts. Since there are no significant shortfalls before FY 97 and since the current Air Force Pilot Distribution Plan (which carries through FY 97) has received widespread publicity and acceptance, we do not advocate increased UPT production prior to that time to counter inventory shortfalls. It is important to note, however, that the "bathtub" effect is the direct result of decreased UPT production levels specified in that plan.

The first alternative to counter outyear inventory problems is to bring in sufficient pilot accessions to ensure that requirements are met.

Alternative Policy 1: Access to Requirements

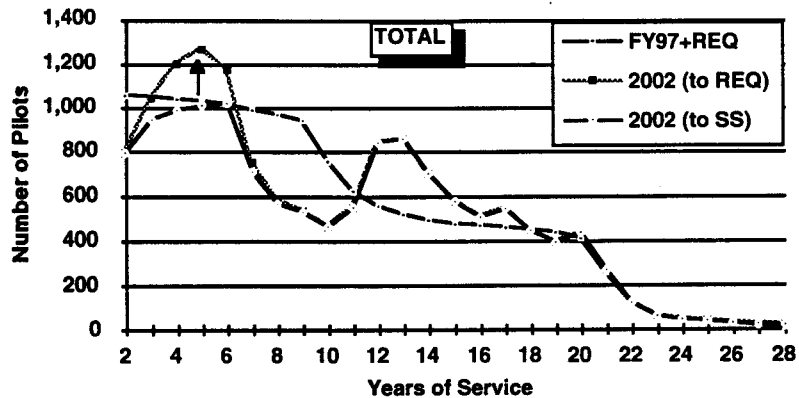
Ensures requirements are met

Generates other pilot management issues

- **UPT infrastructure**
- **Long lead time**
- **Absorption**

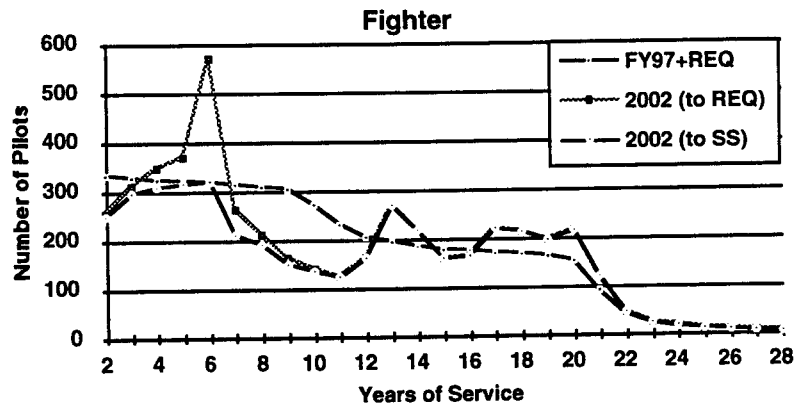
The concept is very simple: The inventory planner need only estimate his continuing inventory each year, determine the difference between requirements and continuing inventory, and ensure that the UPT accessions from the preceding year are adequate to make up the deficit. While the method certainly ensures that requirements are met, it also generates problems. The first of these is the fact that the fixed infrastructure in terms of personnel, equipment, and facilities required to conduct UPT does not lend itself to the rapid fluctuations in UPT production required to implement this concept (without allowing significant inventory overages). Another problem becomes apparent in the description of the concept, since one must know, at a minimum, *next year's losses* in order to determine *this year's UPT accessions*. A single year's lead time might be controllable, but UPT accessions rely in turn on Air Force Academy and Air Force ROTC accessions, increasing the lead time requirement to at least *five years*. Perhaps even more germane to our current discussion, however, is the fact that this policy would generate significant absorption problems for the Air Force.

Accessing to Requirements Creates Absorption Problems



This chart contrasts the FY 2002 inventory profiles obtained by accessing to requirements and accessing to steady-state (SS) sustainment. The required increases in UPT production for the post-1997 cohorts are highlighted by the vertical arrow. Note, for example, that the YoS 5 cohort, which would complete UPT in 1999, must be increased by almost 30 percent (from roughly 1,000 to nearly 1,300) to meet requirements. The Air Force currently hopes to have the ability to absorb 1,000 new pilots each year by 1999, but absorbing 1,300 new pilots in a single year clearly exceeds any projected capability. And the problem becomes worse in the individual MWS categories.

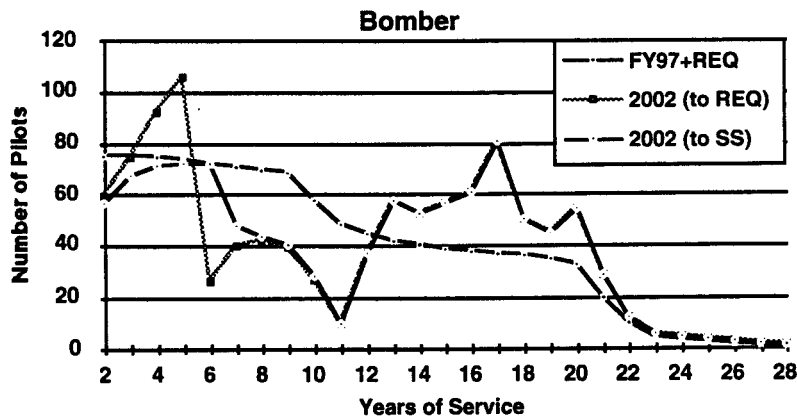
Accessing to Requirements Creates Absorption Problems



Here we see that fighter production would be nearly double the steady-state sustainment level to meet requirements in FY 99 (again the YoS 5 cohort), and this production is *more than* twice that of the preceding year.

It turns out that even those MWS categories that have no real problems with outyear inventories cannot reasonably be expected to access to requirements.

Accession to Requirements Creates Absorption Problems



This chart shows that bombers, whose outyear inventories are projected to meet requirements, could not adhere to a strict accession-to-requirements policy as a result of temporary inventory overages in the meantime. Avoiding these overages would mean a very low bomber production level in FY 98 (again, the YoS 6 cohort, and the first whose production is not fixed by the Air Force Pilot Distribution Plan), followed by a nearly fourfold increase the very next year. The major problem here, of course, is caused by the erratic annual changes in new production, not by an intrinsic inability to absorb the new pilots. This leads to the next policy option that we want to examine.

Alternative Policy 2: Optimize UPT Production

Averaging requirements creates a smoother UPT production flow

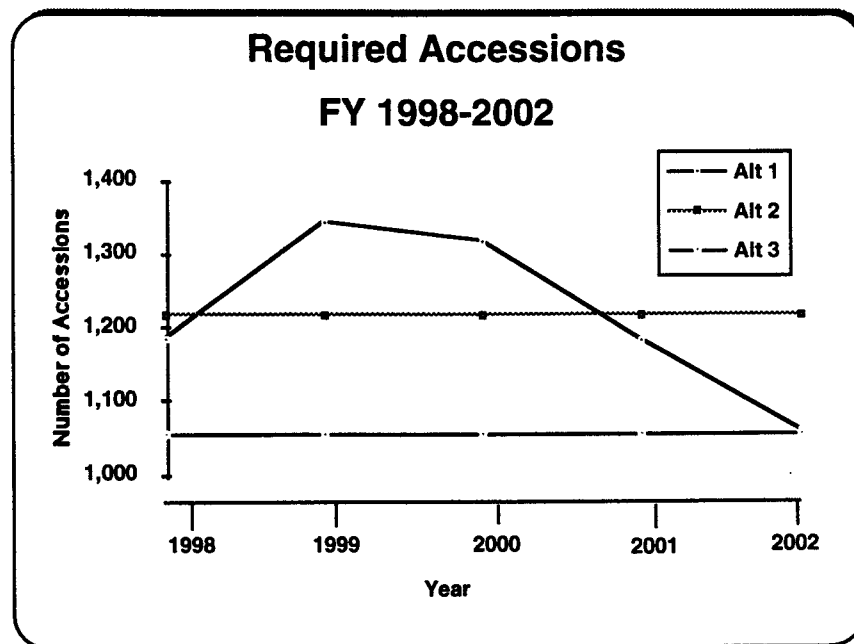
- **Previous Air Force/OSD agreements used five year averages to determine UPT production objectives**

Smoothed UPT production and adjustments in MWS distribution may increase absorption capacity

The second policy alternative is to optimize UPT production, both over fiscal years and by MWS. The bomber problem that we just looked at goes away, for example, if we simply average requirements over a nominal period of time to smooth production flow. Indeed in the early 1970s, the Air Force and OSD had agreements to use five year averages to establish pilot production objectives.⁸ Smoothing across MWS categories could also increase overall absorption ability by increasing production (and possibly accepting temporary overages) in MWSs in which additional absorbing cockpits are available. Then adjustments could be made as other MWS categories generated sufficient absorbing cockpits.

⁸USAF *Personnel Plan, Vol II*, 6 June 1975, p. 2-6, paragraph 2-2b.

Despite the advantages of smoothing, however, it will not completely eliminate outyear inventory problems.



This chart compares annual pilot production rates required for Alternative 1 (accessing to requirements), Alternative 2 (smoothing annual production), and the steady-state sustainment level, which is essentially equal to Air Force estimates of outyear absorption ability (Alternative 3). It shows that, even after averaging production rates over the entire five year period, production levels required to meet requirements still exceed absorption ability by some 160 pilots per year (1,215 versus 1,053). Thus, Alternative 2 certainly reduces the absorption problem, but it cannot completely correct actual inventory shortfalls. This fact is reinforced by assessments of individual MWS categories.

Alternative Policy 3: Reexamine UPT Instructor Pilot Policies

Retain First Assignment Instructor Pilots (FAIP) in specialized UPT

- **No MWS means no immediate absorption need**
- **Experiences faster when eventually absorbed**
- **Increases overall absorption ability which could counter bathtub effect**
- **Provided essential flexibility in past**
- **Has disadvantages**
 - **Lack of mission experience in IP force**
 - **Off-track for operational career**

Our next alternative examines UPT instructor manning policies that affect pilot inventory management issues. The first of these is a new Air Force policy that will require that all UPT instructors complete an operational flying tour in an appropriate MWS before assuming UPT instructor duties. This change is important because it reduces absorption ability. Previously the majority of UPT instructor pilots have been First Assignment Instructor Pilots (FAIPs), who are trained as instructors immediately following UPT without an intervening operational flying assignment. Thus, FAIPs need not be absorbed into an MWS category upon completing UPT. When they go to a specific MWS eventually (typically after a three year tour as an instructor), their instructor experience has developed their overall flying skills to the point where they can meet MWS *experience criteria* more rapidly than can raw UPT graduates. Thus, they create additional *absorbing cockpits* in their MWS faster by becoming experienced more rapidly. The net result is increased absorption ability within the overall pilot inventory. Since absorption ability is the primary reason for the low UPT production levels through FY 97, this policy decision makes a sizable contribution to the "bathtub" effect, which is the result of that low production. The use of FAIPs has provided essential flexibility in the past by allowing UPT production to remain stable even when absorption ability within individual MWSs is changing.

The new policy will essentially eliminate FAIPs by 1995. Its purpose is to ensure that all instructors will possess operational mission experience prior to training new pilots. It also has the advantage of identifying new pilots with an operational mission track at the start of their flying careers so that no questions arise as to which track they are on. These are important advantages, but without additional study it is not clear at this point that they fully offset the disadvantages in inventory management options generated by the new policy.

**Alternative Policy 3:
Reexamine UPT Instructor Pilot Policies (2)**

Use civilian contract or ARC pilots as UPT Instructor Pilots

- Reduces overall pilot requirements
- Strong historical precedent for civilian contract
- Disadvantages of experience, quality control, and unknown cost

Consolidate UPT operations with Navy

- Potential economies of scale must be confirmed
- Also fits with UPT optimization

Other UPT instructor pilot (IP) policy options have the advantage of reducing overall pilot requirements. There is strong historical precedent, for example, for the use of civilian pilots under contract as instructors. General "Hap" Arnold, the World War II leader of the Army Air Forces, learned to fly in 1911 under civilian contract from the Wright brothers.¹¹ Indeed the primary phase (representing the first half) of pilot training was conducted under civilian contract until the 1960s. A similar policy at this point would clearly reduce the requirement for active Air Force pilots.

Another alternative that would reduce active pilot requirements would be to use reserve component pilots in the UPT instructor force. (The Navy has employed this technique with some success.) Either of these alternatives raises additional issues regarding instructor force experience, quality of training, and costs, all of which must be examined further before recommendations can be made.

Another option that deserves further study is to examine what efficiencies and economies in terms of costs and manpower might be realized by consolidating (at least parts of) UPT operations for the Air Force and Navy. This alternative has congressional attention and relates directly back to our second alternative, which addressed optimizing UPT production.

¹¹Thomas M. Coffey, *Hap*, The Viking Press, New York, 1982, p. 3.

The UPT instructor requirement is not an insignificant portion of overall requirements. The new policy that eliminates FAIPs, for example, generates an additional requirement for over 600 fighter pilots by the end of FY 97, a number twice as large as the fighter pilot shortfall projected for that point in time. Another way to view this fact is to recognize that, had the policy change not been made, there would be a 300 pilot *surplus* in fighters at that time. This leads into our next alternative.

Alternative 4: Redistribute Non-MWS Specific Requirements Among MWS

Shifts, but does not reduce, requirements

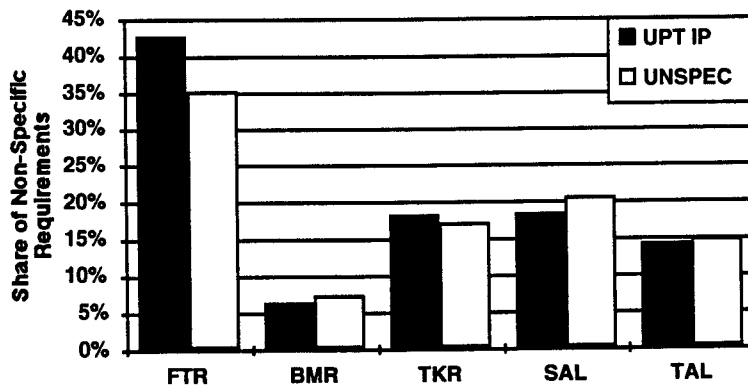
Adjusts imbalances among MWSs

Unspecified (and manyear) requirements represent 11 percent of total requirements

Unspecified (and manyear) and UPT Instructor Pilot requirements represent 23 percent of total requirements

Many pilot requirements are *non-MWS specific* in that they do not require specific MWS expertise. Adjustments among MWSs to meet these requirements can be used to minimize the impact of an inventory shortfall, even though they will not eliminate it completely. The policy decision to eliminate FAIPs as UPT instructors generates an additional non-MWS specific category of some consequence. The basic *unspecified* requirement category (and we include the unspecified portion of manyear requirements here) was identified earlier and represents 10.9 percent of all pilot requirements, while the UPT IP requirements (previously included in the *training* category) represent another 12 percent of total requirements, bringing the non-MWS specific total to 22.9 percent of all requirements. The method used to distribute these non-specific requirements can have a major effect on specific MWS inventory shortfalls.

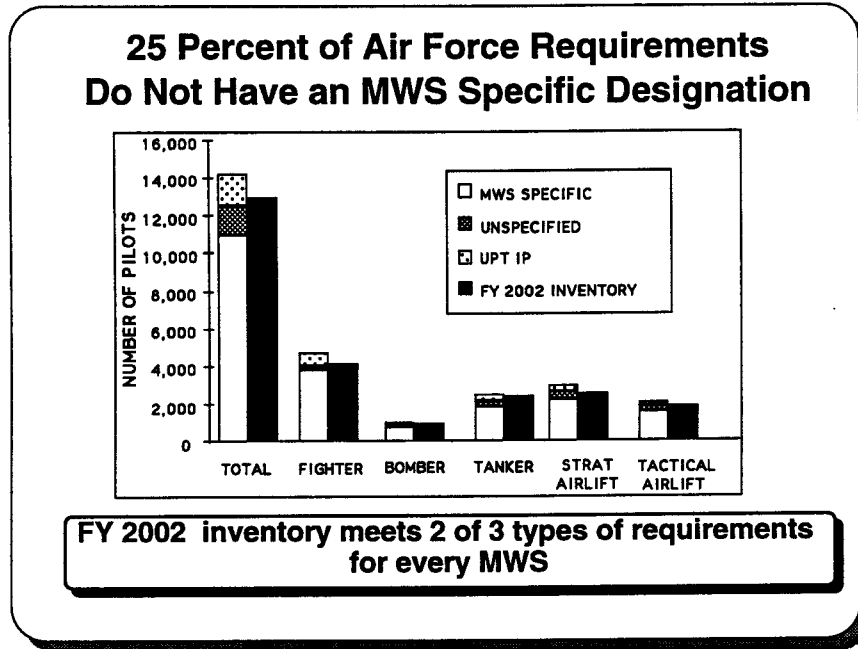
A Major Reason for Fighter Shortage Is Its Share of Non-Specific Requirements



This chart illustrates one method for distributing the non-MWS specific requirements by MWS. The unspecified requirements are distributed proportionately based upon the distribution of requirements that are MWS specific, while the UPT IP requirements are distributed in accordance with the Air Force directive,¹² which sets IP needs for the new Specialized UPT (i.e., dual fighter/bomber and tanker/transport track) program. The inventory management and personnel procedures, however, typically improve the distribution process simply by assigning whatever pilots are available to unspecified billets. Such adjustments are certainly feasible in the distribution method. It also becomes clear that most of the outyear inventory shortfall in fighters results from the decision to require that 43 percent of all specialized UPT IPs (611 of 1,429) be fighter pilots.

¹²AF/XOO/DPX message 182041Z, February 1993.

Similar statements are true of other MWSs as well. Indeed we can break requirements into the following groupings: (1) MWS specific requirements, (2) formal *unspecified* requirements (again including unspecified manyear requirements), and (3) UPT IP requirements.



This chart shows that outyear inventory shortfalls for all MWSs are somewhat limited in scope inasmuch as they fail to meet requirements in only one of these categories. We have elected to add unspecified (UNSP) requirements in the chart before adding UPT IP requirements, but it does not matter how the categories are ordered; projected outyear inventories are adequate for two of them in every MWS.

Alternative 5: Increase Retention

Most obvious course

Increase retention now?

- **Required retention may be hard to achieve**
- **Inventory overages until 2002**
- **Exacerbates experience maldistribution**
- **Voluntary losses may not be adequate to meet ARC prior service accession requirements**

Increase retention in future?

- **Will be even harder to achieve**
- **Will not meet requirements**
- **ARC problem persists (and may get worse)**

Our last alternative is to increase retention. This is the most obvious course to reduce inventory shortfalls, and it should also help to counter the "bathtub" effect. Inventory managers can initiate retention policies immediately and generate inventory increases in each of the intervening years, or they can wait until the shortages are imminent and take more dramatic action. Problems exist for either course.

A useful measure of retention is the expected TARS for each UPT graduate, which evaluates the expected number of years each pilot remains on active duty after he receives his wings. Our projection model used retention rates that yield a TARS value of approximately 13.5 years. This retention estimate incorporated the new eight year active-duty service obligation and assumed that the pilot bonus (ACP) program would continue. It reflects our assessment of airline demand discussed earlier in this report, and it is also consistent with past experience data and future behavior estimates shared with us by Air Force analysts. To examine the effect of an immediate increase in retention, we looked at retention patterns, which yield a TARS value of 14.5 years. Though this value is close to the historical highs for this measure and would be extremely difficult to maintain throughout a full decade, it represents a reasonable upper bound for retention estimates in the environment expected for the period.

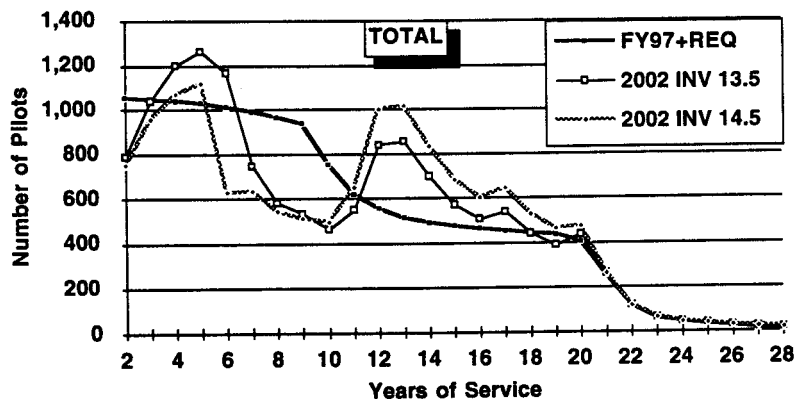
A second problem is that, since inventories are currently decreasing toward a relatively stable requirements level, increased retention extends the period during which we can expect overages. Indeed overages will continue until either shortages occur or a balance can be achieved and maintained.

The most surprising result of our analysis is that increased retention exacerbates the experience maldistribution. It was completely counterintuitive to discover that it actually makes the “bathtub” worse instead of better. The succeeding chart confirms this finding for total inventory, and our assessment shows similar results for individual MWS categories.

A potentially serious problem with increased retention is that it reduces the size of the loss pool of prior service pilots that feeds the ARC. We will look at projected losses, which should probably generate concern even at our basic retention estimates.

Current annual losses are simply not high enough to allow inventory managers to wait until the shortfalls are imminent and to expect to counter them successfully in a single year.

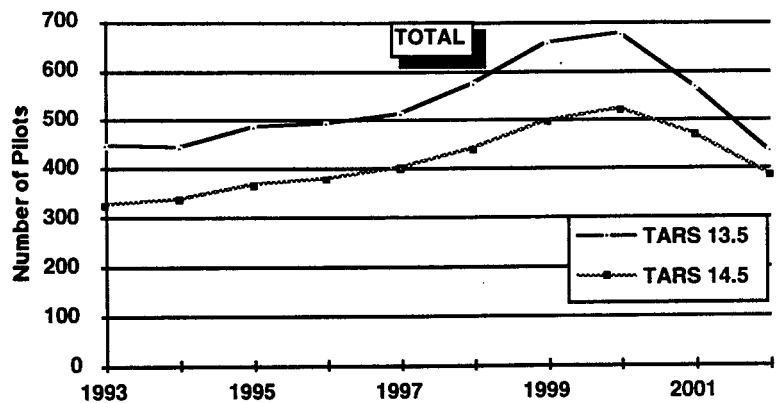
Increased Retention Provides Little Help (TARS Increases from 13.5 to 14.5 Years)



If we compare the FY 2002 pilot inventory projection obtained using basic retention rates (TARS = 13.5) with the corresponding inventory projection obtained using increased retention rates (TARS = 14.5), we see that the "bathtub" appears worse rather than better. The reason for this is that increased retention retains higher inventory levels in the years immediately preceding 2002, thereby limiting absorption ability and UPT production. Similar results exist for the individual MWS categories.

The new eight year ADSO means that pilots will not be able to leave active duty voluntarily until their 10th year (i.e., upon completing at least one year of UPT plus eight years rated for a total of nine). Since reserve retirement eligibility requires the last eight "qualifying" years to be spent in an ANG or AFR status, the ARC has concentrated in the past on pilots with no more than 12 YoS. This establishes an excessively narrow range, however, so we have expanded the range to include losses from YoS 10 through YoS 14 to calculate an acceptable pool of active losses to be recruited by the ARC.

Annual Losses May Not Support ARC Needs (TARS Increases from 13.5 to 14.5 Years)



Note: Steady-state losses are 450 for TARS of 13.5 and 330 for TARS of 14.5

The chart shows projected annual 1993 through 2002 active losses in the YoS 10 to YoS 14 range for both the basic (TARS = 13.5) and high (TARS = 14.5) retention patterns. Neither set of losses appears to track favorably with recent ARC hiring experience. Of the active losses that occurred during the five year period from FY 88 to FY 92, the ARC has averaged hiring about 420 pilots per year. These hires represent less than one-third of the available active loss pool during the period.¹³ If the ARC requirement for new hires from among active losses remains at these levels, they will need to hire much higher proportions of the active loss pool. This could require the ARC to become far less selective than they might desire. Note that projected losses peak near the turn of the century, while steady-state annual loss projections for basic retention patterns are fixed at about 450 pilots so that some 93 percent of the annual active loss pool could be required by the ARC. High retention patterns produce an even smaller active loss pool (and steady-state annual losses of only 330 pilots), which could easily be *inadequate to sustain ARC requirements even if they were to decrease substantially*. MWS loss projections indicate that the problem could be amplified when individual MWS categories are examined, depending upon the nature of ARC requirements.

¹³1993 Total Force Update, AFMPC/DPMYAF Briefing, June 1993.

This area requires additional study to define the extent of the problem, particularly when there appears to be congressional interest in increasing pilot retention (possibly by imposing even longer ADSOs).

We next look at policies that can counter the “bathtub” effect generated by projected experience maldistributions.

Alternative Policies Can Correct the "Bathtub" Effect

Policies now under way:

- Drawdown force shaping initiatives
- Minimum field grade manning
- KC-135 third pilot program

Near term policies:

- Encourage early migration from crew ratio force billets
 - Possibly in exchange for early return
- Retain limited FAIP assignment program

Long term policies:

- Draw from staff and elsewhere to man crew ratio billets
- Active-duty tours for selected ARC pilots

Since the problem is generated by low UPT production while the Air Force copes with critical absorption problems generated by the drawdown and the OVAS, increasing absorption ability is the key element of any policy option that aims to correct the "bathtub" problem. Current force-shaping initiatives have freed a sufficient number of additional absorbing cockpits so that inputs into the pilot bank were terminated in FY 93, and the bank will vanish in FY 96 with the last of its pilots completing MWS pipeline training during FY 97. These force shaping initiatives include the Pilot Early Release Program (PERP) and the Bonus Eligible Non-Taker (BENT) initiative. The latter program, which represents the primary recent use of the pilot bonus by the Air Force, removes from cockpit billets those pilots who are eligible for, but elect not to take, the pilot bonus (ACP), and they are reassigned as non-fliers.

The *minimum field-grade manning* initiative limits field-grade manning in operational flying squadrons to only *three officers*: the commander, the operations officer, and *one additional* officer. This initiative has also freed absorbing cockpits.

The *third-pilot program* is unique to KC-135 crews; it replaces navigators (who are in short supply) with a third pilot who is specially trained in the navigational systems available in that particular aircraft. These pilots can expect to upgrade to co-pilot and aircraft commander as their experience permits.

Even though the budget process and its current environment could make it difficult to increase UPT production before FY 96 even if the absorption ability were available, the Air Force needs to implement measures that encourage early migration from those flying jobs that represent absorbing cockpits. An example is the Air Force's recent identification of the *fly-only* track as one with limited promotion potential. It could possibly formalize programs where pilots who voluntarily take early non-flying staff tours could be guaranteed a return to a flying billet when the impact of the "bathtub" effect is at its peak. As an example, a typical pilot completing UPT in FY 91 (when production was 1,460) will be in YoS 8 in FY 97, which is the largest cohort in the FY 97 distribution. Were he to take a nominal four year non-flying assignment in FY 96, it could free an additional absorbing cockpit during the critical period when UPT production must begin to increase to prevent the "bathtub" from getting out of hand. After a short recurrency program in his original aircraft, he could return to a flying job in FY 2001 and be fully qualified for flight lead, instructor pilot, or flight evaluator duties in FY 2002 when the "bathtub" is most pronounced and he is in YoS 13.

Another means of increasing UPT production during the critical period is to retain a limited FAIP program. Under pressure from the MAJCOMs, the Air Staff has already agreed to continue to produce 25 new FAIPs each year (through FY 99) so that the issue is not a clear-cut decision between no FAIPs or some, but rather a discussion on how many FAIPs to train. The option to increase the number above 25 per year can be used as a hedge to ensure that the "bathtub" problem remains manageable.

Regardless of current policy decisions, the "bathtub" will exist in the outyears, and critical flying billets may have to be filled at the expense of some less critical billets in the staff or elsewhere. Another option that should be examined is to use selected ARC pilots in active-duty tours. The ARC arranged to increase its UPT production during the period (FY 93–FY 97) when active UPT production is at its lowest. Thus, there are *more* ARC pilots than normal in the *identical cohorts* where the active Air Force is so short. This circumstance deserves additional study to determine whether it might provide opportunities to benefit *both* active and ARC flying operations.

Conclusions

No critical shortages occur thru FY 1997 in any MWS in either service

Shortages and the “bathtub” effect are potential Air Force problems beyond FY 97

- **Absorption capacity is key factor in problem severity**

Navy comes out of drawdown in better shape than they entered with no major numerical or experience problems

Increased retention provides little help

These are the conclusions generated by our analysis. The last two of these were completely unexpected. The Navy should have no major problems through the period of our analysis (FY 2002). For the Air Force, increased retention does not help either with nearer term shortages or with long term problems. Retaining present pilots in the near term will only exacerbate overage experience cohorts later. In the long term, there are insufficient numbers of pilots in the future cohorts, due to reduced training in the 1990s, to make increased retention of them a solution.

Outline of Briefing

Historical background and context

Pilot requirements

Interaction with civilian airlines

Pilot inventory management

Future policy issues

The preceding analysis has identified a number of areas that we feel need further, careful study as well as a number of policy options that might help the Air Force in dealing with potential inventory problems. The next chart offers a summary of our recommendations.

These are our recommendations.

Recommendations

Redistribute non-specific MWS requirements

Examine assignment alternatives that increase the availability of absorbing cockpits

Smooth UPT production

- **Defer further action to increase UPT production until problem scope and severity are better defined**
- **Limited FAIP use provides a temporary hedge if required**

Study the need for permanent problem resolution and evaluate the merit of these alternatives

- **UPT instructor manning alternatives**
- **ARC/Active flow options**

Study the adequacy of active losses to support ARC

If the problems were mainly with one MWS such as fighters, the first recommendation would shift shortfalls from that MWS to others. The second recommendation is self-explanatory. Both, together with the Air Force initiatives already under way, can go a long way toward controlling the severity of the future pilot inventory problems.

The third recommendation suggests minimizing effects on the training base by balancing UPT needs over a longer period than one year. We feel that no drastic action to increase UPT production is warranted at this time. More extreme policy options can wait until the scope and severity of the problem can be better defined, and the number of FAIPs can be used to provide a hedge during this process.

If the problem is sufficiently severe, its permanent resolution could rely on alternative manning options for UPT instructors. This could include contracted civilian instructors, reserve component instructors, or continued use of FAIPs. No shortage would exist absent the decision to make UPT instructors MWS specific. While there are stated benefits to this, there are costs as well, which should be studied. Cooperative use of active and ARC assets could be mutually beneficial.

An important issue that requires additional study is whether projected active losses will be adequate to support ARC requirements. Unless it is examined carefully, this could present a major problem in the outyears. A growing share of aircraft and missions are being housed in the ARC as the Air Force draws down. This underscores the importance of keeping a total force perspective when considering any of these policy options.

[REDACTED]

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